April 9, 1968 A. A. HUTCHINS 3,376,675

QUICK-CHANGE ROTARY TOOL

Filed May 17, 1965 2 Sheets-Sheet 1

Fig. 1

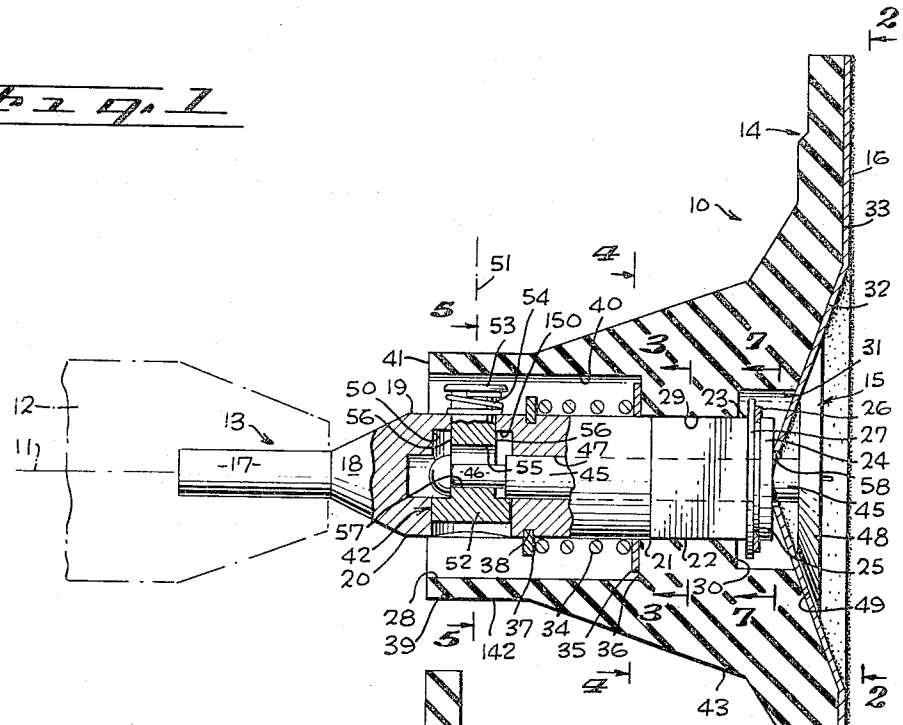
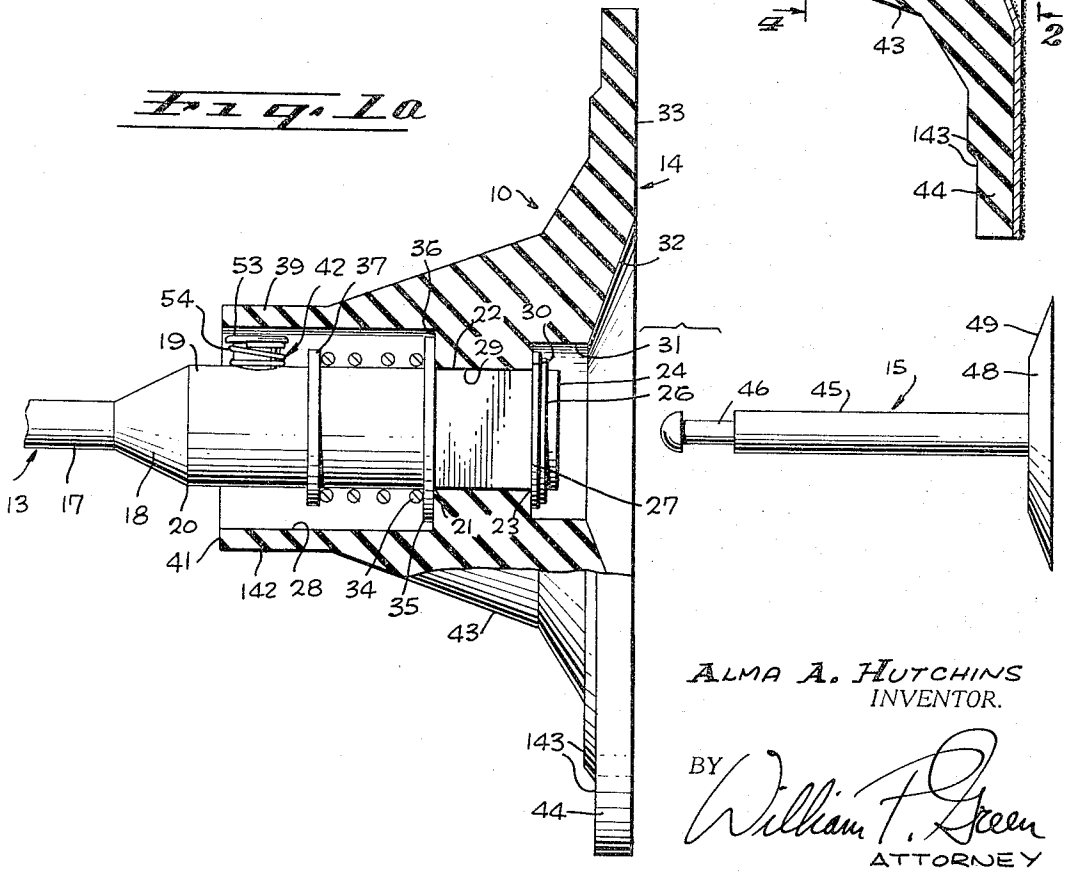


Fig. 1a



ALMA A. HUTCHINS
INVENTOR.

BY William F. Green
ATTORNEY

April 9, 1968 A. A. HUTCHINS 3,376,675

QUICK-CHANGE ROTARY TOOL

Filed May 17, 1965 2 Sheets-Sheet 2

Fig. 3

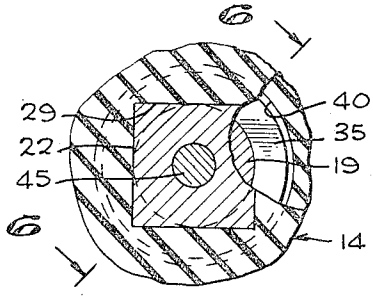


Fig. 4

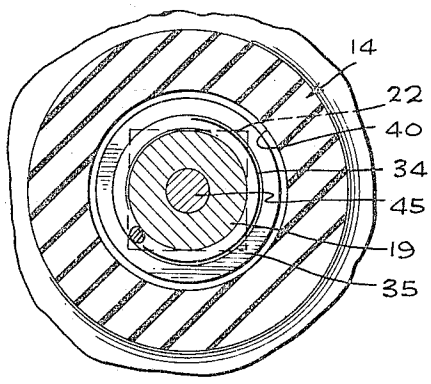


Fig. 5

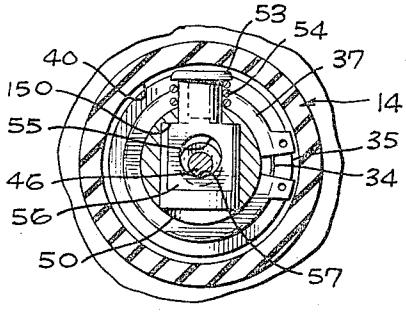


Fig. 6

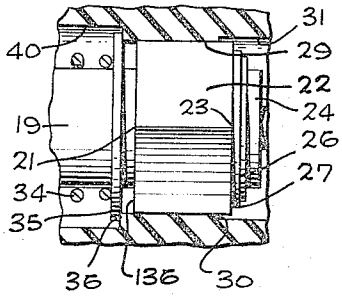


Fig. 7

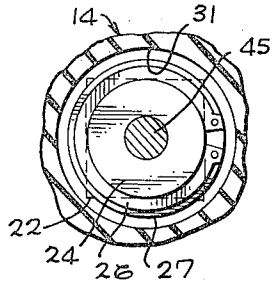


Fig. 2

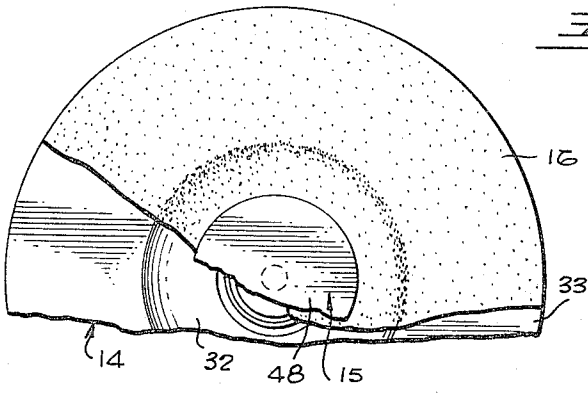


Fig. 8

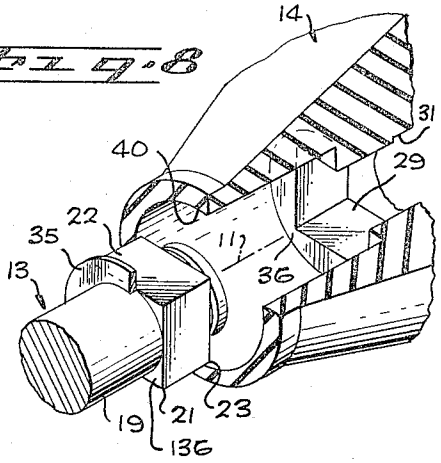


Fig. 9

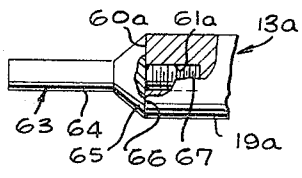
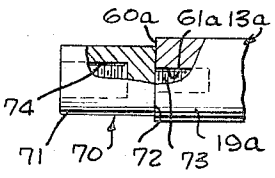


Fig. 10



ALMA A. HUTCHINS
INVENTOR.

BY William F. Green
ATTORNEY

United States Patent Office

3,376,675

Patented Apr. 9, 1968

3,376,675

QUICK-CHANGE ROTARY TOOL

Alma A. Hutchins, 3190 Primavera St., Pasadena, Calif. 91107

Filed May 17, 1965, Ser. No. 456,062
4 Claims. (Cl. 51—376)

ABSTRACT OF THE DISCLOSURE

A quick-change head for a rotary sander, including a rotatable body having an externally square portion and an externally circular portion with a transverse shoulder therebetween, an elastomeric backing element against which a sandpaper disc is received and having an internally square portion received about the square portion of the body, a retaining part detachably connected to the body and acting to retain the sandpaper disc, and a spring disposed about the circular portion of the body and urging the backing element forwardly relative to the body and relative to the retaining unit. The backing element has a rearwardly projecting portion disposed about the body and about a manually actuable member which controls a detent for securing the retaining part to the body.

This invention relates to improved rotary sanding tools and the like, and more particularly to improvements in quick-change rotary heads for detachably carrying a sheet of sandpaper or another similar work engaging sheet or element.

The general object of the present invention is to provide an improved quick-change head in which the removal and replacement of a sheet of sandpaper or other work engaging material is greatly facilitated as compared with conventionally used rotary heads. Preferably, the work engaging sheet or element is attachable to the head by a single simple axially inward motion of a retaining element, which may merely be pressed inwardly relative to the rest of the head to a holding position, and will automatically be retained in that position without further manipulation of the retaining element or head. Further, the sheet may be just as easily released, by actuation of a releasing mechanism which enables the retaining element and sheet to be removed when desired.

A particular object of the invention is to provide a quick-change head having the above discussed advantages of easy retention and release of the work engaging element, and which in addition is especially designed to assure very positive retention and gripping of the work engaging element in the operative condition of the apparatus. Preferably, the work engaging sheet is gripped between the retaining element and a backing structure, and is held between these parts by a yielding force which continually holds the sheet with such effectiveness as to assure its rotation with the head, and its resultant effective action on the work piece.

Structurally, a head embodying the invention includes a backing structure which is driven rotatably, and at the forward side of which there is received the sanding sheet or other work engaging element. In accordance with the invention, this backing structure or part is urged forwardly by a spring or other yielding means, to apply forward force against the work engaging element for attaining the above discussed effective gripping action on that element. The backing structure may be carried by and be driven rotatably by a body structure, which is connectible to a power actuated driving chuck or other drive unit. The retaining element for securing the work engaging element to the device may be releasably securable to the body by a detent member, and preferably in fixed relation to the body, so that when the spring pressed backing structure urges the work engaging sheet or other element forwardly, a portion of that element is pressed tightly against the retaining element.

The above and other features and objects of the invention will be better understood from the following detailed description of the typical embodiment illustrated in the accompanying drawing, in which:

FIG. 1 is an axial section through a sanding head embodying the invention;

FIG. 1*a* shows the device of FIG. 1 with the sandpaper and its retaining element detached;

FIG. 2 is a view taken on line 2—2 of FIG. 1;

FIGS. 3, 4, 5 and 7 are fragmentary transverse sections taken on lines 3—3, 4—4, 5—5 and 7—7 respectively of FIG. 1;

FIG. 6 is a section taken on line 6—6 of FIG. 3;

FIG. 8 is an exploded perspective view of certain portions of the device; and

FIGS. 9 and 10 are partially sectional fragmentary side views of adapters for use with a rotary head embodying the invention.

With reference first to FIG. 1, I have illustrated at **10** a quick-change rotary sanding head which is driven rotatably about an axis **11** by a power driven chuck **12** of an appropriate rotary powered unit, such as an electric or pneumatic drill unit or the like. Head **10** includes a main body element **13**, a backing part or structure **14**, and a retaining element **15** by which the conventional circular sheet of sandpaper or other abrasive or work engaging material is held in the FIG. 1 operative position relative to backing part **14**.

The main body **13** has a first shank portion **17**, which may be externally cylindrical and centered about axis **11**, to be gripped and rotatably driven by chuck **12**. It will also be apparent that shank **17** may be externally or internally threaded, or otherwise shaped to connect to any other type of conventional driving mechanism, instead of the typically illustrated chuck **12**. Beyond its shank portion **17**, body **13** may flare outwardly at **18** to an increased diameter cylindrical external surface **19**, which is centered about axis **11** and may extend between the locations designated **20** and **21** in FIG. 1. Rightwardly beyond the location **21** of FIG. 1, body **13** has an outer surface **22** which in transverse cross section is non-circular, and preferably has the square section brought out in FIG. 3. This square external cross section surface **22** extends from the previously mentioned location **21** to the location **23** of FIG. 1, with the center of the square cross section of course extending along axis **11**. It is preferred that the square defined by the cross section of surface **22** be of a size that the length of each of its four sides corresponds substantially to the diameter of cylindrical surface **19** (see FIG. 3), or stated differently so that the four sides of surface **22** would be tangent to cylindrical surface **19** if it were extended rightwardly. Beyond location **23**, body **13** has a portion **24** of circular cross section, having a groove **25** within which a snap ring is received, with a

circular washer 27 being confined inwardly of the snap ring, so that the snap ring and washer retain backing part 14 on the body as will be discussed in greater detail at a later point.

Backing part 14 is desirably formed of a resiliently deformable material, preferably a suitable rubber which may for best results have a Shore hardness between about 70 and 75. The backing part has a passage 28 extending entirely axially therethrough, for reception of body 13 as shown. This passage has a central reduced cross section portion defining an internal surface 29 within the backing part, which surface is of a square cross section corresponding to outer surfaces 22 of the body, to key backing part 14 to the body for rotation therewith. The backing part, though connected in this manner for rotation with the body, is however free for movement axially relative to the body, by movement of surface 29 axially along the engaged external surface 22 of the body. This axial movement is limited in a rightward direction (as viewed in FIG. 1) by engagement of washer 27 with transverse shoulder surfaces 30 formed in the backing part at the right end of surface 29. The surfaces 30 may extend radially outwardly to the location of an internal cylindrical surface 31 in backing part 14, which may merge with an annular outwardly flaring surface 32 on the backing part. From the outer edge of surface 32, the backing part may have an annular surface 33 which is disposed directly transversely of axis 11 and against which the main working portion of sand paper sheet 16 abuts.

The leftward axial shifting movement of backing part 14 relative to body 13 is yieldingly resisted by a coil spring 34, which at all times is under compression, and bears rightwardly against a washer 35. This washer in turn bears rightwardly against a transverse shoulder 36 formed in and by backing part 14. Preferably, washer 35 has a maximum diameter approximately equal to the diagonal dimension across square portion 22 of body 13 (as seen in FIG. 3), so that the primary engagement between washer 35 and shoulder surface 36 is circularly between the locations of the corners of square surface 22. This relationship will be apparent from a consideration of FIG. 3. It will also be apparent from that figure that the portion of washer 35 which does not engage surface 36 will engage a transverse shoulder surface or series of segmental surfaces 136 on the body in a relation preventing movement of the washer beyond those surfaces. As will be understood, these surfaces 136 (which extend directly transversely of axis 11) are formed at the location 21 at which body 13 changes externally from the circular cross section of surface 19 to the square cross section of surface 22.

The left end of spring 34 may engage a snap ring 37, received and confined within a groove 38 formed in cylindrical surface 19 of body 13. About spring 34, the backing part 14 may have an annular portion 39, containing and forming an inner cylindrical surface 40, which extends from shoulder 36 to the left end surface 41 of the backing part. This tubular portion 39 is thin enough to be readily flexed radially inwardly, for actuation of a latching part 42 which will be discussed in greater detail at a later point. Externally, backing part 14 may have an outer cylindrical surface 142 near end surface 41, and may then flare gradually outwardly at 43 to an increased diameter, and ultimately form essentially annular surfaces 143 extending essentially transversely of axis 11 and parallel to forward surface 33, to define the main backing portion 44 of part 14 for yieldingly holding sheet 16 in operative position.

The retaining element 15 is preferably a rigid metal part, having a shank or shaft portion 45 which is typically externally cylindrical and of uniform diameter except at the location of a reduced diameter cylindrical groove 46 formed in its inner end portion. Shank 45 is slidable axially into and within a cylindrical passage or bore 47 in body 13, of a diameter corresponding approximately to the diameter of shank 45, and centered about and extending along axis 11. At its outer end, shank 45 rigidly carries a circular enlarged diameter head 48, which is centered about and symmetrical with respect to axis 11, and disposed transversely thereof. The inner side of head 48 has a surface 49 which flares essentially in correspondence with, and is opposite, surface 32 of backing part 14, to clamp sandpaper 16 thereagainst.

At the location of groove 46 in the retaining element 15, body 13 has a passage 50, extending therethrough transversely of axis 11. This passage may be cylindrical about an axis 51 disposed transversely of axis 11, and receives a portion 52 of latching part 42 in a relation mounting part 42 for sliding movement relative to body 13 in the direction of axis 51. A screw having a head 53 may be connected into an upper reduced portion of latching part 42, to form an actuating head thereon, with a spring 54 being received between the head and the upper surface of body 13 to normally urge element 42 upwardly as viewed in FIG. 1. The upward movement of latching element 42 may be limited by engagement with an upper reduced dimension shoulder 150 formed at the upper end of passage 50. Portion 52 of latching part 42 may be externally cylindrical about axis 15, except at the location of two opposed flats 56, and contains a cylindrical passage 55 of a diameter corresponding to the external diameter of the main portion of retaining element shank 45, so that the shank may be inserted axially into bore 55. As will be apparent from FIG. 1, the axis of passage or bore 55 extends parallel to main axis 11 of the device, and in one position is coincident with that axis. Also, it is noted that the axial thickness of portion 52 of the latching element 42 along axis 11 is small enough to allow that portion to be partially received within groove 46 of retaining element 15, in the relation illustrated in FIG. 1, in which position one of the transverse flats or shoulder surfaces 56 formed on part 42 engages the side wall 57 of nut groove 46 in a relation holding retaining element 15 against rightward movement as seen in FIG. 1.

To now describe the use of the device shown in the figures, assume that first of all shank 17 of body 13 is connected to the chuck 12 to be driven thereby. In order to secure the circular sheet of sandpaper 16 to backing part 14, the shank 45 of the retaining element 15 is first inserted axially into the usual central opening 58 in the sheet of sandpaper, and is then slipped axially into bore 45 of body 13 of the device. The head 48 of retaining element 15 is then pressed axially inwardly (to the left in FIG. 1) until latch part 45 is actuated upwardly into its FIG. 1 position of holding reception partially within groove 46 of the retaining element. As the tapered left end of shank 45 of the retaining element approaches the FIG. 1 position, that tapered end first deflects latch part 42 downwardly to pass through its aperture 55, and retains the latch part in a lowered position in which its passage 55 is aligned with passage 47 of body 13 until groove 46 is in proper position to enable upward movement of the part to its holding condition.

The parts of the device are so dimensioned that retaining element 15 cannot be forced leftwardly to its FIG. 1 position without leftward movement of backing part 14 against the tendency of spring 34, from the FIG. 1*a* position to the FIG. 1 position in which washer 35 is no longer in engagement with stop shoulder 136 on body 13, and shoulder 30 of backing part 14 is no longer retained against rightward movement by washer 27 and snap ring 26. Thus, spring 34 exerts a rightward force through washer 35 against backing part 14, which in turn exerts a rightward force against the sandpaper sheet 16 to clamp it tightly against head 48 of retaining element 15, in the FIG. 1 latched position of the retaining element. In this way, the sandpaper is tightly held and yieldingly gripped between the backing part and retaining element to assure positive retention of the sandpaper, and to assure effective turning of the sandpaper with the backing

plate and retaining element, without slippage of the sandpaper such as may occur in many prior structures. During rotation of the head, the annular back portion **39** of backing part **14** encloses or extends about spring **34**, latching element **42**, and the related parts, in a manner preventing the user from accidentally placing his finger in the path of one of these rapidly spinning parts, and thus injuring himself. When it is desired to remove sandpaper sheet **16** for replacement, the user merely presses radially inwardly against tubular portion **39** of backing part **14** at a location radially opposite head **53** of the latch part, to thus press the latch part to a position in which its passage **55** is aligned with and concentric with passage **47** of the body, and the main outer cylindrical surface of retaining element shank **45**, so that the left hand portion of shank **45** may pass rightwardly through passage **55**. The rightward force of compression spring **34** (transmitted through washer **35**, shoulders **36** and backing part **14**) is sufficient to cause retaining element **15** to pop outwardly a short distance (to the right in FIG. 1) as soon as latch part **42** has been released, so that head **48** of the retaining element may be grasped to pull the retaining element completely away from its reception within body **13**, as to the detached position of FIG. 1*a*. In this condition, spring **34** urges washer **35** rightwardly against shoulder surface **136** of body element **13** (FIGS. 6 and 8), and through shoulders **36** of working element **14** holds this element in the rightwardly displaced position of FIG. 1*a* in which shoulders **136** and **36** are in alignment with one another. The original sheet of sandpaper **16** may then be removed, and another sheet attached to the unit in the same manner as the first.

FIG. 9 shows fragmentarily a quick-change rotary head which may be considered as identical with that of FIGS. 1 through 8, except that the main body **13***a* of the device, corresponding to body **13** of FIG. 1, is provided with an internal axially extending threaded bore **61***a*, rather than the outwardly projecting tool engaging shank **17** of FIG. 1. This bore **61***a* may then threadedly receive a mating externally threaded drive shaft element of a power operated driving tool, to connect the device to such a threaded drive structure instead of the chuck illustrated at **12** in FIG. 1. Bore **16***a* may also receive an externally threaded projection or shank **67** of an adapter element represented at **63** in FIG. 9, which element may have a shank portion **64** corresponding to shank **17** of FIG. 1, to thereby adapt the device for connection to the FIG. 1 type of chuck **12** when desired. As will be apparent from FIG. 9, element **63** may have an enlarged portion **65**, presenting a transverse shoulder **66** which is engageable against a shoulder **60***a* of part **13***a* in the assembled condition of the parts. External surface **19***a* of element **13***a* may be of a diameter corresponding to that of surface **19** of FIGS. 1 and 2, and element **13***a* may, to the right of the portion illustrated in FIG. 9, be constructed exactly the same as is element **13** of FIGS. 1 and 2, to carry the backing element, latching part, retaining element, saidpaper sheet, etc. in the manner discussed previously.

FIG. 10 illustrates the manner in which the main body element **13***a* of FIG. 9 may be connected to a second type of adapter **70**, having an axially extending internally threaded bore **74**, for receiving an externally threaded shank of another type of rotary drive element. Element **70** has a threaded projection **73** which screws into passage **61***a* of element **13***a*, to the point at which transverse shoulder **72** of adapter **70** bears against shoulder **60***a* of element **13***a*. Additionally, other adapters similar to those of FIGS. 9 and 10 may be provided, but having shanks **64** or internal passages **74** of different diameters for engagement with other sizes of driving elements, so that a single unit embodying the invention may be adapted for connection to any type of drive device which may be encountered.

I claim:

1. A quick-change rotary head for holding a replaceable work engaging element, comprising a body structure adapted to be driven rotatably about an axis by a power unit and having an externally non-circular portion and an externally essentially circular portion with an essentially transverse shoulder therebetween, a backing structure carried by said body structure for rotation therewith and at a forward side of which said work engaging element is removably receivable, said backing structure having an internally non-circular portion about said non-circular portion of the body structure driven rotatably thereby but free for relative axial movement, a retaining unit for detachably securing said element against removal from said backing structure, means for detachably connecting said retaining unit to said body structure, and a spring disposed about said circular portion of the body structure and yieldingly urging said backing structure forwardly relative to said body structure and said retaining unit, said spring having a first end which acts rearwardly against said body structure and a forward end which acts forwardly against said backing structure and whose forward motion is limited, in a forward position of the backing structure, by said shoulder on the body structure.

2. A quick-change rotary head comprising a body structure adapted to be driven rotatably about an axis by a power unit, a backing structure carried by said body structure for rotation therewith and at a forward side of which a work engaging element is removably receivable, and manually actuable mechanism carried by and rotating with said body structure and movable relative thereto, said backing structure having a flexible portion disposed about and essentially enclosing said mechanism and manually deflectable inwardly against said mechanism to actuate the latter.

3. A quick-change rotary head for holding a replaceable work engaging element, comprising a body structure adapted to be driven rotatably about an axis by a power unit and having an externally non-circular portion and an externally essentially circular portion, a backing structure carried by said body structure for rotation therewith and at a forward side of which said work engaging element is removably receivable, said backing structure having an internally non-circular portion about said non-circular portion of the body structure driven rotatably thereby but free for relative axial movement, said backing structure having an internally enlarged portion rearwardly of said non-circular portion with an essentially transverse surface therebetween, a retaining unit for detachably securing said element against removal from said backing structure, means for detachably connecting said retaining unit to said body structure, and a spring disposed about said circular portion of the body structure and acting against said transverse surface, and yieldingly urging said backing structure forwardly relative to said body structure and said retaining unit.

4. A quick-change rotary head for holding a replaceable work engaging element, comprising a body structure adapted to be driven rotatably about an axis by a power unit and having an externally non-circular portion and an externally essentially circular portion with an essentially transverse shoulder therebetween, a backing structure carried by said body structure for rotation therewith and at a forward side of which said work engaging element is removably receivable, said backing structure having an internally non-circular portion about said non-circular portion of the body structure driven rotatably thereby but free for relative axial movement, said backing structure having an internally enlarged portion rearwardly of said non-circular portion with an essentially transverse surface therebetween, a retaining unit for detachably securing said element against removal from said backing structure, a latch mechanism for detachably connecting said retaining unit to said body structure, and a spring disposed about said circular portion of the body structure

and acting against said transverse surface and yieldingly urging said backing structure forwardly relative to said body structure and said retaining unit, said spring having a first end which acts rearwardly against said body structure and a forward end which acts forwardly against said transverse surface of the backing structure and whose forward motion is limited, in a forward position of the backing structure, by said shoulder on the body structure, said internally enlarged portion of the backing structure being flexible and tubular and disposed about said spring and said latch mechanism and being actuable inwardly against the latter to actuate it.

References Cited

UNITED STATES PATENTS

881,691	3/1908	Hughes	51—376 X
1,002,845	9/1911	Hodskinson	51—377
2,671,994	3/1954	Hickman	51—376
2,764,853	10/1956	Rhees	51—376
2,789,402	4/1957	Guilbert	51—377
2,800,751	7/1957	Buckner	51—377
2,800,752	7/1957	Short	51—376

HAROLD D. WHITEHEAD, *Primary Examiner.*