June 4, 1957 A. BASHLOW ET AL 2,794,353

DEPTH LIMITING MEANS FOR DRILLS

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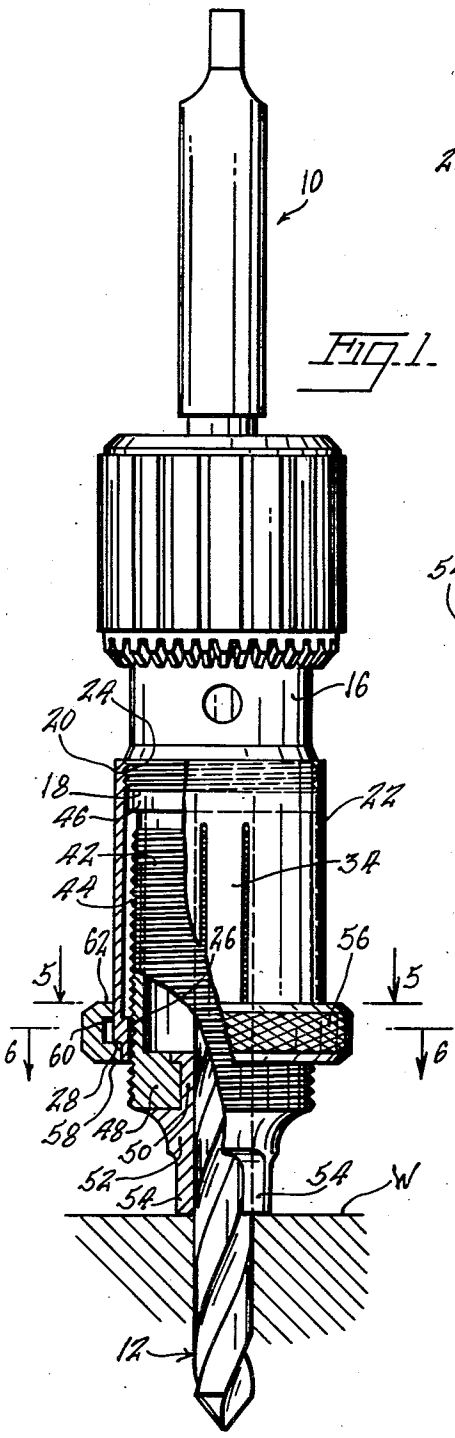


Fig. 1.

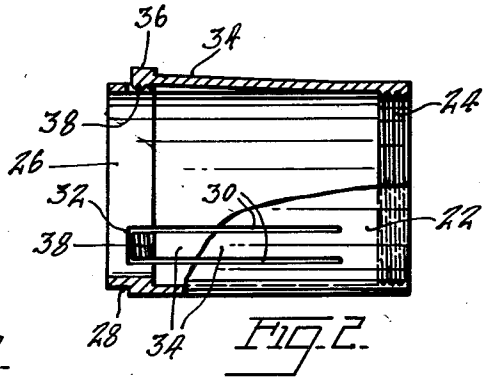


Fig. 2.

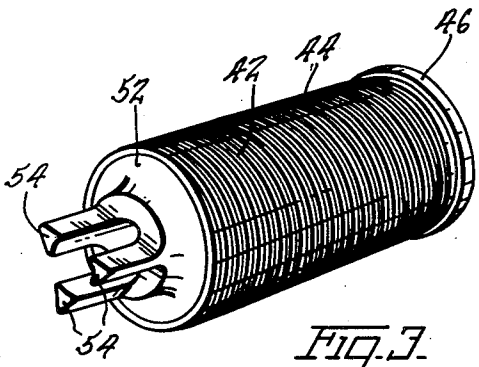


Fig. 3.

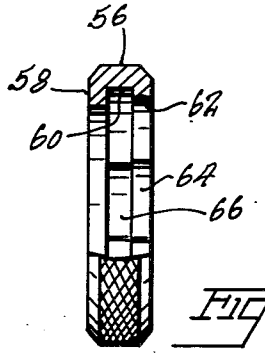


Fig. 4.

INVENTORS
ARCHIE BASHLOW
BY EDWARD SNOW
Zoltan A. Polachek
ATTORNEY

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DEPTH LIMITING MEANS FOR DRILLS

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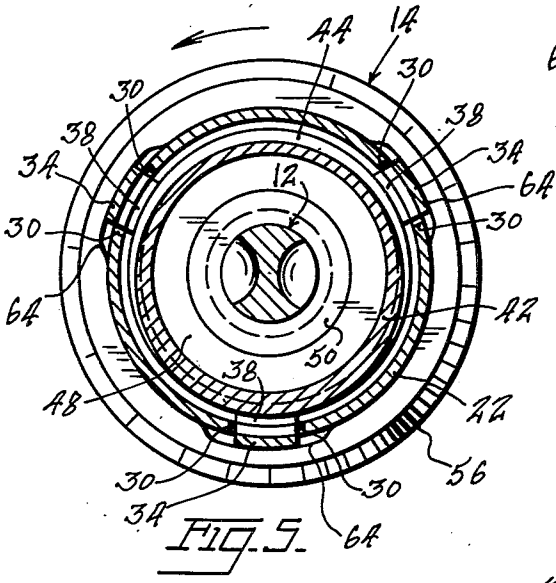


Fig. 5.

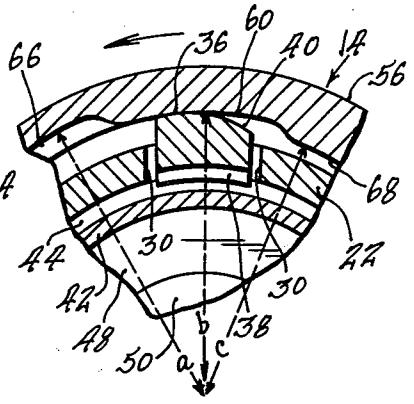


Fig. 8.

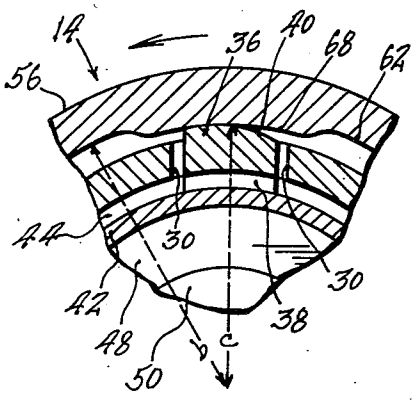


Fig. 9.

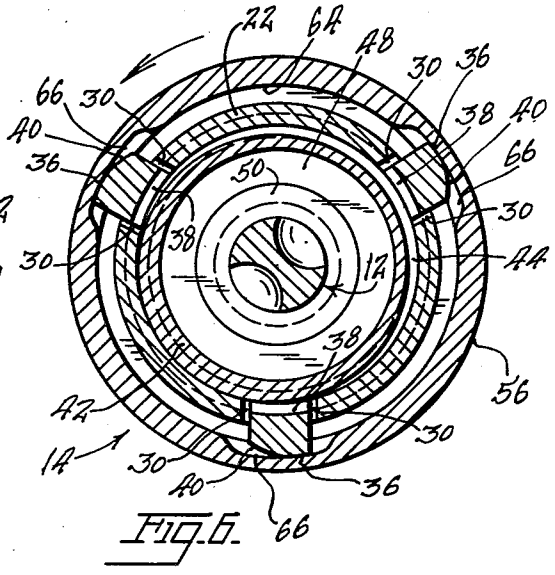


Fig. 6.

INVENTORS
ARCHIE BASHLOW
BY EDWARD SNOW
Zoltan H. Blaschek
ATTORNEY

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DEPTH LIMITING MEANS FOR DRILLS

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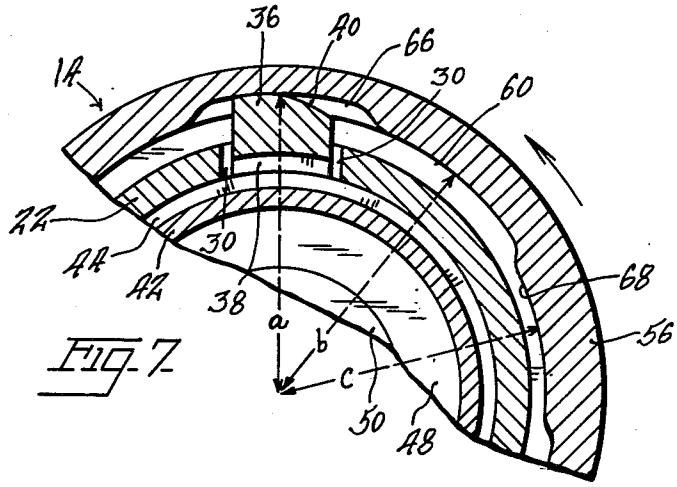


Fig. 7

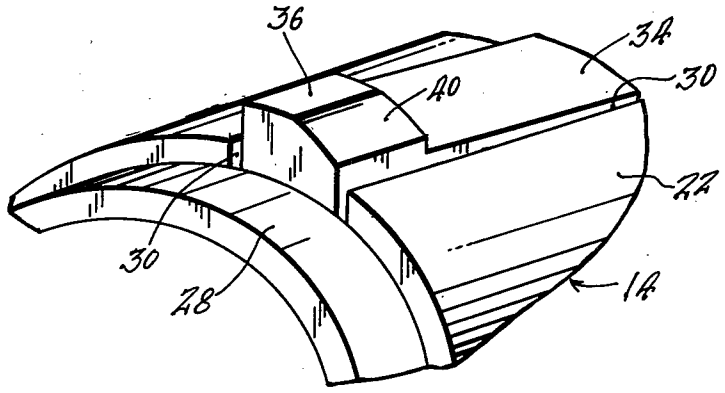


Fig. 10

INVENTORS
ARCHIE BASHLOW
BY EDWARD SNOW
Walter H. Bachelder
ATTORNEY

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2,794,353

DEPTH LIMITING MEANS FOR DRILLS

Archie Bashlow and Edward Snow, Brooklyn, N. Y.

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3 Claims. (Cl. 77—55)

This invention relates to drill chucks and, more particularly, to an adjustable depth limiting means for drill bits in a drill chuck.

Heretofore, it has been proposed to provide means for limiting the depth to which a drill bit will penetrate the work. In some instances, devices which have been conceived for this purpose have been mountable not upon the drill itself, but rather, upon the support on which the work is disposed. In these circumstances, the means limits not the depth of the hole drilled by the bit, but rather, the thickness of the material remaining after the hole has been drilled to its intended maximum. This is not always feasible, and as a result, such devices fail to work with complete satisfaction in every instance.

Other prior art devices are so designed as to require a separate depth limiting means, for each size of drill bit. In such instances, a substantial number of drill stops or guides must be maintained, and here again, though these devices are mountable upon the drill and do not have the disadvantage of the first type of drill guide discussed herein, they fail to provide the best possible solution to the existing problem.

Yet another category of prior art devices includes those which, though of an adjustable nature so far as the selection of the hole depth is concerned, still are not completely satisfactory, due to a design which renders swift and easy adjustments, within close limits, difficult if not impossible.

In view of the characteristics which have been noted in drill guides or depth limiting means previously devised, the present invention aims to provide a precision depth limiting means for drill presses, portable electric drills, and the like, which means will be mountable directly upon a conventional drill chuck; will accommodate the entire range of drill bit sizes capable of being gripped by the chuck; will be capable of rapid adjustment for a selected hole depth, even where a wide difference exists between the settings at which the depth limiting means has previously been positioned and that at which it is to be set anew; will be adjustable for a selected hole depth precisely and within very close tolerances; and will be capable of being swiftly locked when the selected setting has been made, thus to hold the desired adjustment.

Summarized briefly, the invention includes a stationary tube fixedly connectable to a drill chuck about a bit held by the chuck. Spring tongues formed upon the tube are radially shiftable to each of three positions relative to a sleeve extending within the tube. In one position the tongues are wholly out of engagement with the sleeve, permitting the sleeve to be manually grasped and freely shifted axially of the drill bit to a selected location in respect to the tip of the bit. In a second position, the tongues, which have internal threads, are biased into threaded engagement with said sleeve, the sleeve having threads from end to end thereof. In this position, which is usually selected after the so-called "coarse" adjustment of the sleeve has been effected while the tongues were in their first position, the sleeve can be given a "fine" adjustment, by being rotated while in threaded engagement with

the tongues. A precision setting of the sleeve in respect to the tip of the drill bit is thus achieved. In a third position, the tongues are biased radially still further in an inward direction respecting the sleeve, so as to lock the sleeve and tongue threads, thereby fixedly locking the sleeve to the tube at the selected precision setting of the sleeve. Carried by the sleeve is a rotatable contact shoe, which engages against the work, when the drill bit has penetrated the work to the selected depth.

For further comprehension of the invention, and of the objects and advantages thereof, reference will be had to the following description and accompanying drawings, and to the appended claims in which the various novel features of the invention are more particularly set forth.

In the accompanying drawings forming a material part of this disclosure:

Fig. 1 is a view of a depth limiting means and associated chuck, partly in side elevation and partly in longitudinal section, a drill bit carried by the chuck being illustrated at maximum depth in a work piece.

Fig. 2 is a view partly in side elevation and partly in longitudinal section of the tubular housing, per se.

Fig. 3 is a perspective view of the sleeve, per se.

Fig. 4 is a view partly in elevation and partly in section of a setting ring, per se.

Fig. 5 is a transverse sectional view on line 5—5 of Fig. 1.

Fig. 6 is a transverse sectional view on line 6—6 of Fig. 1.

Figs. 7, 8 and 9 are enlarged, fragmentary, transverse sectional views on the same cutting plane as Fig. 6, showing the setting ring and one of the spring tongues in the coarse adjustment, fine adjustment, and locking positions, respectively.

Fig. 10 is a fragmentary, enlarged perspective view of the tubular housing.

In Fig. 1, a work piece W has been illustrated in association with a conventional chuck **10**, which would be engaged in a suitable piece of drilling apparatus, not shown. A drill bit **12** is engageable in and rotates with the chuck, and attached to the chuck and rotatable bodily therewith is the depth limiting means **14** constituting the present invention.

The chuck will not be described in detail, since it is basically conventional, and since it can be varied as desired. In accordance with the invention, however, the chuck body **16** has at its outer end, shown as the lower end in the drawings, external threads **18**, at the inner end of which there is formed upon the chuck body an outwardly directed flange **20** forming a stop shoulder. The device **14** constituting the invention includes a cylindrical open-ended tube **22**. This may be termed for clarity of description a stationary tube, it being understood that this term is used in the sense that the tube **22** is made rigid with the chuck, and remains stationary while moveable parts of the depth limiting means are being shifted during the setting of the device at a selected position of adjustment. Of course, after the device has been properly adjusted and is locked in the desired position, the tube **22** rotates with the chuck during use of the drilling apparatus, and the remaining parts of the device all rotate with the chuck and tube, with the exception of a swiveled contact shoe which, when it engages against the work piece responsive to penetration of the work piece by the drill bit to the selected maximum depth, remains stationary while the rest of the parts rotate pending the bringing of the drill bit and chuck to a halt.

At its upper end, the tube **22** has internal threads **24**, engaging the threads **18**, the shoulder **20** limiting the inward threading of the tube and binding against the adjacent tube end eventually, to lockably engage the tube with the chuck body.

At its other or outer end, the tube **22** has a portion **26** of reduced inner diameter, and on the outer surface of said outer end of the tube, there is formed a circumferential recess **28** of angular cross section.

Formed in the tube **22** are longitudinal slots **30**. These are arranged in pairs, the slots of each pair being spaced apart a relatively short distance and being extended in parallelism. In the illustrated example three pairs of slots are shown, spaced 120° apart about the circumference of the tube. The number of pairs of slots can be varied, if desired.

The slots of each pair, at their outer ends, are connected by a transverse slot **32**, and there is thus defined, between each pair of slots, a spring tongue **34**. Each tongue **34** is tensioned to spring radially outwardly of the tube at its free end, the free end of each tongue being that located adjacent the transverse slot **32**. As shown in both Figs. 2 and 10, the spring tongues, when free to flex by reason of their inherent resiliency, shift outwardly to a distinctly noticeable extent, relative to the body of the tube **22**.

At their free ends, the spring tongues **34** are thickened, both outwardly and inwardly of the tube body, thus to provide on each tongue an outer projection **36** and an inner projection **38**, the inner projection being threaded as best shown in Fig. 2.

The outer projection (Figs. 7–9) has a laterally extending slope **40** at one side, for a purpose to be made presently apparent.

Extending within the tube **22** is a sleeve **42** which is somewhat greater in length than the tube, so as to extend at one end beyond the outer end of the tube. Sleeve **42** is threaded substantially from end to end thereof, the sleeve at its inner end being formed with an outwardly projecting shoulder **46** slidably engageable against the inner surface of the tube **22**. In this connection, the outer diameter of the threads **44** is less than the reduced inner diameter provided at the outer end of tube **22**. As a result, sleeve **42** can be freely shifted longitudinally of the tube **22**, during the making of coarse adjustments.

On the outer end of the sleeve **42**, there is formed an inwardly directed circumferential flange **48**, said flange defining an end wall on the sleeve having a center opening. Rotatably engaged in said center opening is the cylindrical extension **50** of a contact shoe **52**. Extension **50** has an outwardly directed lip engageable in a complementary recess formed in the flange **48**, to prevent the shoe from becoming disconnected from the sleeve. The body of the contact shoe, as will be noted from Fig. 1, is of tapered formation, the larger end of the body being in contact with the outer end of the sleeve. The shoe **52** tapers toward its lower or outer end, and at said outer end thereof is formed with triangularly spaced longitudinal extensions **54** constituting chip breakers, and also constituting the portion of the device that engages against the work when the hole has been drilled by the bit to the selected depth (see Fig. 1).

A setting ring **56** is exteriorly knurled to facilitate rotation thereof. Ring **56** is circumposed about the outer end of tube **22**, and is rotatable upon the tube. Along one edge, the ring **56** has an inwardly directed flange **58**, the inner surface of said flange constituting one side wall of an internal, circumferentially extending recess **60** of the ring. The other side wall of the recess is defined by an inwardly directed circumferential flange or lip **62** formed upon the other edge of the ring, and having a greater inner diameter than the flange **58**. Flange or lip **58** engages in the recess **28**, to prevent movement of the ring in one direction upon the tube, and also to provide an increased bearing surface during rotation of the ring relative to the tube **22**.

Spaced 120° apart about the lip **62** are shallow elongated recesses **64**. The recesses **64** have sloped ends, and in the coarse adjustment position of the spring tongues, the recesses **64** are adapted to receive the bodies of said spring tongues, immediately adjacent the thickened free

end portions of the tongues. Formed in the floor of the recess **60**, and registered with the recesses **64**, are deeper recesses **66**, also having sloping walls, as best shown in Fig. 7. Recesses **66** are adapted to receive the projections **36** in said coarse adjustment position of the parts.

In use of the device, and assuming that the parts are in their coarse adjustment position, they will appear as in Figs. 5, 6, and in particular Fig. 7. As will be noted, the threaded inner projection **38** of each tongue is wholly out of engagement with the threads **44** of the sleeve **42**.

As a result, the sleeve **42** can be manually adjusted freely longitudinally of the chuck and tube, so as to dispose the tips of the chip breaker members **54** a selected distance from the tip of the drill bit. This is a coarse adjustment, and as will be noted, can be effected with great rapidity.

As a next step, the ring **56** is rotated through perhaps 45° in the direction shown by the arrow in Fig. 7. This disposes the parts in the position shown in Fig. 8, to permit making of fine adjustments. In this position of the parts, the threads **38** are engaged with the threads **44**, to an extent sufficient to cause the sleeve to be threadedly engaged with the tube, thereby preventing further free longitudinal movement of the sleeve without rotation of the same. Instead, the making of fine adjustments is achieved by rotating the sleeve, so as to threadedly advance or retract it in respect to the tip of the drill bit.

When the fine adjustment has been made, the ring is rotated in the same direction, through an additional 45° more or less, and this causes a binding or locking of the threads **38**, **44**, to an extent sufficient to prevent relative threading of the sleeve and spring tongues. The sleeve is thus fixedly locked in the selected position of fine adjustment, and the drilling can proceed. Ultimately, when the bit penetrates the work, the free ends of extensions **54** will come against the work, and the contact shoe will accordingly stop rotating so as to prevent marring of the work. The remaining parts of the device, of course, can rotate with the chuck until the drill is brought to a halt.

As will be noted in Fig. 7, the distance from the common center of the several parts to the floor of the recess **66** has been designated at *a*. The distance between said center and the floor of the circumferential recess **60** has been designated at *b*, and the distance between said center and a high surface **68** formed in the floor of circumferential recess **60** has been designated at *c*. Distance *a* is greatest, and distance *c* is the least.

The high surfaces **68** are exaggerated in Figs. 7–9 for purposes of illustration, but in actuality, would represent only a very slight thickening of the setting ring, at the locations of said high surfaces. This thickening is, however, just sufficient to bind the threads **38**, **44** tightly against one another. There would be three high surfaces, spaced 120° apart.

It will be seen that a cam action is achieved, wherein, on movement of the setting ring to one position, the spring tongues are free to expand to their maximum extent, so as to bear against the bottoms of the three recesses **66**. When the ring is rotated in the specified direction, the slope at one end of each recess **66** will engage the slope **40** of each spring tongue, so as to bias the spring tongue radially inwardly, until ultimately, the outer surface of the projection **36** is in full engagement with the floor of circumferential recess **60**. In this position, the threads **38**, **44** are engaged to an extent sufficient for threading of the sleeve inwardly or outwardly of the tube **22**. Further rotation in the same direction will cause the high surfaces **68** to be registered with the spring, the spring tongues riding onto the high surfaces so as to be biased inwardly to an additional, small extent, for locking of the sleeve in the selected position of fine adjustment.

It will be observed that the construction is such as to permit rapid adjustment of the sleeve to be made, to effect a preliminary setting of the sleeve relative to the drill bit.

In the making of this preliminary setting the sleeve can be moved, for example, from a previous setting at which a very shallow hole would be drilled by the bit, to a new setting at which a very deep hole would be drilled by the bit. After the preliminary setting, fine adjustments are possible merely by a further small partial rotation of the setting ring, and after the fine adjustment has been made, still another small partial rotation of the setting ring will lock the parts. Rapid and exact precision adjustments and locking is thus achieved.

While we have illustrated and described the preferred embodiment of our invention, it is to be understood that we do not limit ourselves to the precise construction herein disclosed and the right is reserved to all changes and modifications coming within the scope of the invention as defined in the appended claims.

Having thus described our invention, what we claim as new, and desire to secure by United States Letters Patent is:

1. In a device for adjustably limiting the extent of penetration of a work piece by a drill bit the combination, with a bit-holding drill chuck, of a tube secured to said chuck, a threaded sleeve mounted within the tube for rotation and for movement longitudinally of the tube, means on the sleeve adapted to engage the work piece after penetration of said piece by the bit to a selected extent governed by disposition of the sleeve at a selected position of adjustment longitudinally of the tube and bit, threaded means on the tube shiftable between a first position out of engagement with the sleeve for permitting free longitudinal movement of the sleeve to locate the same at a preliminary setting, a second position in threaded engagement with the sleeve for requiring threaded advancement of the sleeve to locate the same in a position of fine adjustment, and a third position in which the threads of the second-named means are locked with those of the sleeve to make the sleeve fast to the tube in said position of fine adjustment thereof, and means on the tube for biasing said sleeve-engaging means to each of the three positions thereof, said last-named means comprising a cam ring rotatably mounted upon the tube and adapted for biasing the second-named means to each of said three positions thereof, said second-named means comprising a circumferential series of longitudinally extending spring tongues formed upon the tube, said tongues being tensioned to normally flex radially of the tube in an outward direction, the ring being adapted to bias said tongues inwardly to each of said three positions, said tongues being spaced circumferentially of the tube uniform distances apart, the cam ring having three cam surfaces for each of said tongues, said cam surfaces corresponding to said three positions of the tongues and being spaced different distances from the center of the cam ring, the cam ring being formed with a circumferential internal recess receiving the free end portions of the tongues, the floor of said recess defining the tongue-engaging cam surface when the tongues are in their second position, said cam ring having a circumferential series of recesses formed in the floor of said circumferential recess, the floors of the last-named recesses constituting the tongue-engaging surfaces in the first position of the tongues.

2. In a device for adjustably limiting the extent of penetration of a work piece by a drill bit the combination, with a bit-holding drill chuck, of a tube secured to said chuck, a threaded sleeve mounted within the tube for rotation and for movement longitudinally of the tube, means on the sleeve adapted to engage the work piece after penetration of said piece by the bit to a selected extent governed by disposition of the sleeve at a selected position of adjustment longitudinally of the tube and bit, threaded means on the tube shiftable between a first position out of engagement with the sleeve for permitting free longitudinal movement of the sleeve to locate the same at a preliminary setting, a second position in threaded engagement with the sleeve for requiring threaded advancement of the sleeve to locate the same in a position of fine adjustment, and a third position in which the threads of the second-named means are locked with those of the sleeve to make the sleeve fast to the tube in said position of fine adjustment thereof, and means on the tube for biasing said sleeve-engaging means to each of the three positions thereof, said last-named means comprising a cam ring rotatably mounted upon the tube and adapted for biasing the second-named means to each of said three positions thereof, said second-named means comprising a circumferential series of longitudinally extending spring tongues formed upon the tube, said tongues being tensioned to normally flex radially of the tube in an outward direction, the ring being adapted to bias said tongues inwardly to each of said three positions, said tongues being spaced circumferentially of the tube uniform distances apart, the cam ring having three cam surfaces for each of said tongues, said cam surfaces corresponding to said three positions of the tongues and being spaced different distances from the center of the cam ring, the cam ring being formed with a circumferential internal recess receiving the free end portions of the tongues, the floor of said recess defining the tongue-engaging cam surface when the tongues are in their second position, said cam ring having a circumferential series of recesses formed in the floor of said circumferential recess, the floors of the last-named recesses constituting the tongue-engaging surfaces in the first position of the tongues, the floor of the circumferential recess of the ring having circumferentially spaced high surfaces alternating with the second-named recesses and constituting the tongue-engaging surfaces when the tongues are in their third, locking positions.

3. A combined drill stop and depth gauge including a tubular member provided with means for attachment to a chuck supporting a drill, spring fingers outstruck from said tubular member and spaced circumferentially therearound, enlargements at the free ends of said fingers, one side of each enlargement having a cammed surface, the other side of each enlargement having screw threads, an externally screw-threaded sleeve telescopically arranged within the tubular member with one end thereof protruding from the end of the tubular member, an inwardly directed flange on the protruding end of said sleeve defining an end wall for said sleeve, said end wall having a central opening, a tubular contact shoe extending outwardly through said central opening and being swivelly seated on the inner surface of said end wall, chip breakers carried on the outer end of said contact shoe, and a manipulating ring freely rotatable on the outer protruding end of the tubular member for urging said spring fingers into threaded engagement with the sleeve, said ring having a plurality of inner camming surfaces for selectively biasing movement of the spring fingers.

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