Aug. 26, 1952 M. M. MARTIN ET AL 2,608,114

COUNTERSINKING TOOL

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Fig. 1.

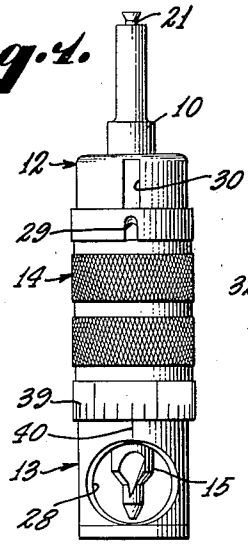


Fig. 2.

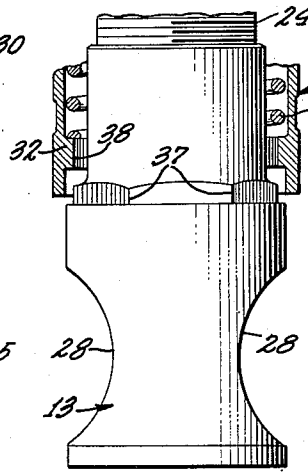


Fig. 3.

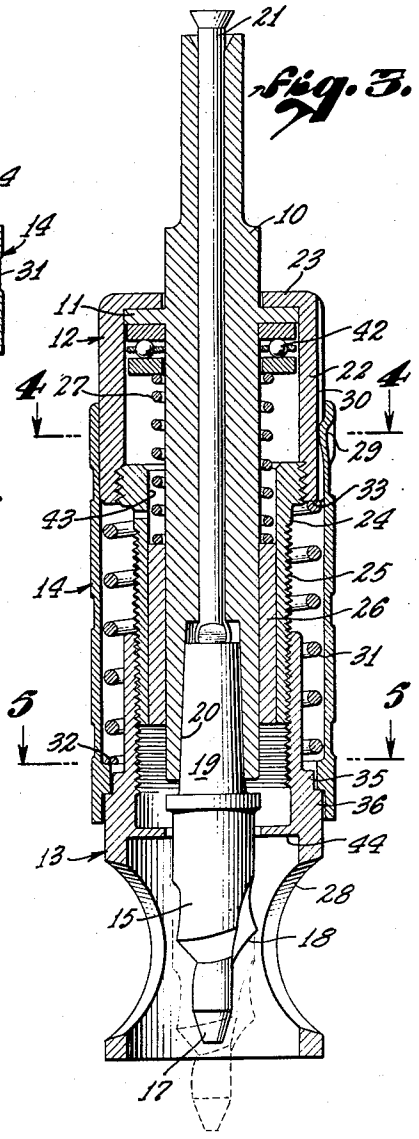


Fig. 4.

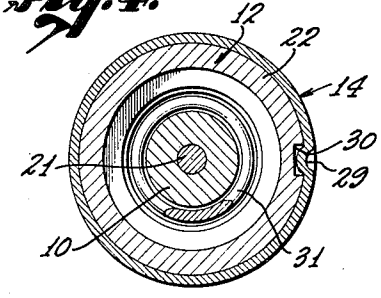
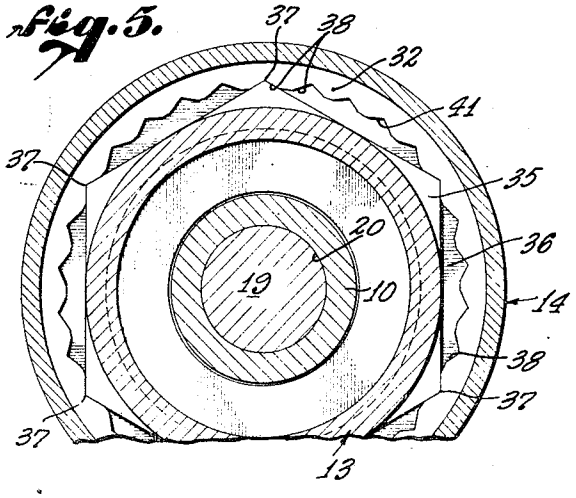


Fig. 5.



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COUNTERSINKING TOOL

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6 Claims. (Cl. 77—73.5)

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Our invention relates to control mechanisms for regulating the depth of penetration of tools into work pieces.

While the principles involved are applicable to various types of cutting tools and the like, especially where accuracy and uniformity are desirable, the invention is particularly adapted for regulating the depth of penetration of drills or the depth of cut of countersinking tools. For the purpose of disclosure and illustration the invention will be described as applied to a countersinking tool.

A device of the type here under consideration includes some type of housing member that permits predetermined relative longitudinal movement of the tool and also includes a stop member in screw-threaded engagement with the housing member. The stop member abuts against work pieces for adjustably limiting penetration by the tool. Our invention meets certain pressing needs for improvement in the manner in which such a stop member is adjustably locked against rotation relative to the housing member.

One such need is to save time in changing from one depth adjustment to another. Ideally the operator should be able to snap the control mechanism from one depth adjustment to another in some simple manner and with accurate measurement of the extent of adjustment change. The present invention makes such a change in adjustment possible in practically one continuous hand movement by the operator.

Another need is to avoid difficulties caused by foreign particles lodging between co-acting engagement surfaces of such elements as shoulders, teeth, keys, notches and the like where such elements are used for setting the device at various depth adjustments.

Our invention shields such co-acting engagement surfaces by suitable surrounding walls and further provides for sliding engagement to make the co-acting surfaces self-cleaning.

The preferred form of the invention employs longitudinal or axial sliding engagement for adjustably locking the two cooperating parts against relative rotation. A special advantage of such an arrangement is that any foreign particles lodged in the locking mechanism merely limits the extent of the relative axial movement without affecting the accuracy of the rotary positioning of the parts.

To meet these and other needs for inventive improvement our invention provides a locking sleeve that slidingly surrounds both the housing member and the stop member, being keyed to

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one of the members to move axially into sliding locking engagement with other member at selected positions of relative rotation between the two members. A suitable spring normally holds the locking sleeve in locking position but readily permits manual retraction to free the stop member for rotary adjustment. Merely releasing the sleeve causes automatic locking at the new adjustment.

Other features and advantages of our invention will be apparent from the following detailed description taken with the accompanying drawings.

In the drawings:

Figure 1 is a side elevation of the preferred form of the invention;

Figure 2 is a fragmentary view on a larger scale partly in section showing how the sleeve retracts to free the rotary stop member;

Figure 3 is a view in longitudinal section on the same scale;

Figure 4 is a transverse sectional view taken on the line 4—4 in Figure 3; and

Figure 5 is an enlarged transverse sectional view taken on the line 5—5 in Figure 3.

The principal parts of the embodiment of the invention shown in the drawings include a rotary tool shaft 10 having a radial flange 11, a housing or housing member generally designated 12 surrounding the shaft, a stop member generally designated 13 and a locking sleeve generally designated 14.

The shaft 10 which is adapted to be power driven in the usual manner holds a countersinking tool 15 which may have a pilot or guide point 17, a cutting portion 18 and a tapered shank 19. In the construction shown the tapered shank 19 seats with friction grip in a tapered socket 20 in the tool shaft 10 and may be released when desired by the thrust of a knock-out pin 21.

The housing 12 may be made in two cylindrical parts, an upper part 22 having an end wall 23 and a lower part 24 of smaller diameter. These two parts of the housing 12 are assembled together by screw-threads as shown and the lower part 24 has relatively fine peripheral threads 25 for adjustably holding the stop member 13. Mounted with a forced fit inside the lower part 24 of the housing is a bushing 26 which forms a bearing for the shaft 10.

Inside the housing 12, a suitable helical spring 27 sleeves the shaft 10 and acts in compression between the shaft flange 11 and the bushing 26 to urge the shaft flange towards the end wall 23, thus tending to retract the tool 15 into the hous-

ing as shown in Figure 3. It can be pointed out here that the defining edge of the opening in the wall 23 very closely circumscribes the shaft 10 and this prevents entry into the housing of foreign particles.

The stop member 13 is of cylindrical configuration and has suitable side apertures 28 for the discharge of cuttings and chips formed by the tool 15 as well as to permit observation of the tool 15. In effect, the stop member 13 is an adjustable extension of the housing 12 by means of which the over-all length of the device may be varied for controlling the depth of penetration of the tool 15.

As best shown in Figures 3 and 4, the locking sleeve 14 may be keyed to the housing 12 by a suitable dimple or offset 29 that sliding engages a key-way 30 in the housing 12. Thus the locking sleeve 14 is held against relative rotation but is free to slide on the housing towards and away from locking engagement with the stop member 13. For continuously urging the locking sleeve 14 into such engagement a suitable helical spring 31 is compressed between an inner radial flange 32 of the locking sleeve and an annular shoulder 33 formed by the upper part 22 of the housing 12. Preferably the periphery of the locking sleeve is knurled as shown in Figure 1 to facilitate manual retraction against the resistance of spring 31.

While the locking sleeve 14 and the stop member 13 may be adapted in any suitable manner for mutual locking engagement to prevent rotation of the stop member, preferably the two parts telescope into engagement with the engaging surfaces sliding past each other longitudinally of the device. For this purpose the stop member 13 is formed with a radial locking portion 35 of non-circular configuration in plan and an adjacent radial stop portion 36 which may be circular in plan. The previously mentioned inner radial flange 32 of the locking sleeve 14 is of non-circular configuration in plan to slidingly interlock with portion 35 and move into abutment with stop shoulder 36.

While various non-circular interlocking configurations may be used I prefer the interlocking relationship best shown in Figure 5. Note that the plan configuration of the locking portion 35 is that of a hexagonal nut with six pointed locking shoulders 37 while the edge face of the coacting flange 32 is formed with a plurality of equally spaced teeth or serrations 38 for interlockingly engaging the shoulders 37 selectively at a number of different positions of relative rotation.

The arrangement may be described as one in which the locking sleeve is continuously keyed to the housing 12 for axial movement relative thereto, but is adapted for retractibly and selectively keying with the stop member 13 at a number of different positions of relative rotation.

The lower end of the locking sleeve 14 may be provided with a graduated scale 39 to be read with reference to an index mark 40 on the stop member 13, each graduation corresponding to one of the multiple notches or key ways 41 formed by the serrations 38 of the locking flange 32. Preferably the pitch of the fine threads 25 and the number of the key ways 41 are such that one graduation represents one thousandth of an inch adjustment in the depth of penetration of the tool 15.

To change the adjustment of the device, the operator merely retracts the locking sleeve 14 with a quick motion by one hand, twirls the stop member 13 to a new position with the other hand and then releases the locking sleeve to re-lock the stop member. The tool is now ready for use.

It should be noted that the range of reciprocation of the tool 15 is limited at one end by the abutment of the flange 11 against the inner side of the end wall 23 of the housing member 12. As the tool is first brought into engagement with the work piece and the pilot pin 17 passed downwardly into the opening, which is to be countersunk, the flange 11 will move out of engagement with the end wall 23 before the shaft 10 is rotatably driven. There is thus no frictional engagement between the flange 11 and the end wall 23 during the time that the shaft is driven.

Movement of shaft 10 in the opposite direction is limited by engagement of a thrust bearing 42 fixed to the shaft 10, referring to Figure 3, with the upper end face of the lower housing part 24. It should be noted here that the spring 27 in this relative position of the shaft 10 will be compressed within the anular chamber 43 formed about the shaft 10 by the bushing 26 and the lower housing part 24. The thrust bearing 42 effectively prevents any temperature rise which might otherwise be caused by frictional engagement between the now rotating flange 11 and the end face of the lower housing part 24.

It is to be noted that the sleeve spring 31 is completely enclosed at all times and that the interlocking surfaces are shielded by the telescoping of the locking sleeve 14 over the stop member 13. Any small foreign particle lodged between the locking sleeve 14 and the stop member 13 will merely limit the relative sliding movement without preventing the desired interlocking relationship. Since such particles tend to be dislodged by the sliding movement, the interlocking surfaces are in effect self cleaning.

To further prevent entry of foreign particles into the device, the stop member 13 is formed on its inner wall with an inwardly directed annular flange 44, the inner edge face of which closely circumscribes the tool 15. It will thus be seen that the flange 44 forms a guard or shield effective to prevent entry of chips and metal cuttings into the upper portion of the stop member 13, which might otherwise foul the threads thereof. As metal cuttings or chips might become embedded in the lower face of the stop member as the same is repeatedly pressed into contact with work pieces, it is now preferred to deposit on the lower end of the stop member a hard chrome layer. This is preferredly done by an electroplating process.

Although the now preferred embodiment of the present invention has been shown and described herein, it is to be understood that the invention is not to be limited thereto, for it is susceptible to changes in form and detail within the scope of the appended claims.

We claim:

1. A device of the character described for adjustably limiting the downward thrust of a tool relative to a work piece, comprising: a housing member slidingly engaging the tool and limiting the downward thrust of the tool relative thereto; a stop member for contact with a work piece to fix the spacing of said housing member relative to the work piece, said stop member being in screw-threaded engagement with the housing member for adjustment of said spacing by relative rotation between the two members; a first circular series of locking shoulders on said stop

member; a locking sleeve extending above said stop member and keyed to said housing for axial movement relative to the stop member; a second circular series of locking shoulders on the interior of said locking sleeve for retractable downward movement with the locking sleeve into interlocking engagement with said first series of shoulders, said second series of shoulders being spaced upward from the lower end of the sleeve whereby said lower end normally encloses both series of shoulders when the two series are interlocked thereby to discourage the entrance of foreign material into the region of the interlocked shoulders; and yielding means acting between said sleeve and housing to urge the sleeve downward into locking position.

2. A device as set forth in claim 1 in which said lower end of the sleeve extends below said second series of shoulders sufficiently to enclose said first series of shoulders when the sleeve is retracted to disengage the two series of shoulders.

3. A device as set forth in claim 1 in which said stop member has an external wall below said first series of shoulders telescopically fitting into said lower end of the locking sleeve.

4. A device as set forth in claim 3 in which said lower end of the sleeve extends below said second series of shoulders sufficiently to surround said external wall of the stop member when the locking sleeve is retracted to disengage the two series of shoulders.

5. A device of the character described for adjustably limiting the downward thrust of a tool relative to a work piece, comprising: a housing member slidingly engaging the tool and limiting the downward thrust of the tool relative thereto; a stop member for contact with a work piece to

fix the spacing of said housing member relative to the work piece, said stop member being in screw-threaded engagement with the housing member for adjustment of said spacing by relative rotation between the two members; a first circular series of locking shoulders on said stop member; a locking sleeve extending above said stop member and keyed to said housing for axial movement relative to the stop member, the lower end of said sleeve having an outer cylindrical surface extending downward to the region of an outer circumferential surface of said stop member; a second series of locking shoulders on the interior of said locking sleeve for retractable downward movement with the locking sleeve into engagement with said first series of shoulders, said second series of shoulders being spaced upward from the lower end of the sleeve; yielding means to urge said sleeve into locking position; and index means on said two outer surfaces to indicate the rotary position of said stop member relative to said housing member.

6. A device as set forth in claim 5 in which said index means includes a graduated circumferential scale on said outer cylindrical surface.

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