IDENTIFYING MEANS FOR TOOLS

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2 Claims. (Cl. 48—22)

The present invention relates to a new and improved tool provided with novel structure arranged in code fashion for identifying the tool.

The present application comprises a continuation of the Sedgwick et al., application Serial No. 802,924, filed March 30, 1959, now Patent No. 3,052,999, dated September 11, 1962, which, in turn, was a continuation-in-part of U.S. application Serial No. 744,976, filed June 27, 1958, now Patent No. 3,052,011, dated September 4, 1962. The Sedgwick Patent, 3,052,999, is directed to a species of the instant invention wherein the adjustable code elements are applied on a tool holder which is adapted to receive a tool. The instant invention is directed to the placement of the code elements on the tool itself. The use of the word “tool” in the claims herein is directed specifically to the tool element or bit itself and not to the combination of a tool and a holder therefor.

The primary object of the present invention resides in the provision of a new and improved tool provided with identifying means for facilitating the selection of a desired tool from a plurality of different types and sizes of tools.

Another object of the present invention resides in the provision of coded information on each tool for the purpose of identifying the different tools in a group of tools of different types and sizes.

Another object of the present invention resides in the provision of an improved identifying means in the form of different contours on the tool to facilitate the selection of different tools from a plurality of different types and sizes of tools.

Another object is to provide a new and improved tool provided with identifying means in binary code fashion by means of which the selection of any desired tool from a plurality of different types and sizes of tools is facilitated.

Another object is to provide a new and improved means in the form of a plurality of axially spaced differently positioned grooves on each of the tools for facilitating the selection of a particular tool from the plurality of tools of different types and sizes.

A further object of the invention resides in the provision of differently positioned lands and grooves on each tool for facilitating the selection of one particular tool from a plurality of different types and sizes of tools.

A more specific object is to provide a series of abutting axially aligned rings of different diameters on the shank of each tool to thereby provide lands and grooves in different combinations on each tool and coded in a manner for separately identifying each of the tools to facilitate the selection of a particular tool from a plurality of different types and sizes of tools.

Other objects and advantages of the present invention will become apparent from the following description of illustrative embodiments thereof.

In the drawings:

FIGURE 1 is a longitudinal axial sectional view through a toolholder embodying the teachings of the present invention for identifying any particular tool mounted in the toolholder, the identification for the particular tool being incorporated with the toolholder as claimed in the aforementioned Sedgwick patent;

FIG. 2 illustrates a modified form of the invention shown in FIG. 1 for identifying the identical tool shown in FIG. 1;

FIG. 3 is a fragmentary sectional view similar to FIG. 1 showing the coding on the tool arranged for identifying a different tool;

FIG. 4 is a fragmentary view showing the structure of FIG. 2 with the lands and grooves arranged in a different combination for identifying the identical tool shown in FIG. 2;

FIG. 5 is an elevational view of one of the ring elements shown in FIG. 1;

FIG. 6 is an elevational view of one of the spacer rings shown in FIG. 1;

FIG. 7 is a fragmentary section view of a rotatably mounted magazine adapted to carry a plurality of different sized and types of material removing together with selector means engageable successively with the several toolholders to effect the automatic selection of any particular tool from the plurality of tools at a tool selector and change station of the machine;

FIG. 8 is a bottom view of the selector means shown in FIG. 7 with the selector means engaging the coding structure on the toolholder for effecting the automatic selection of a particular tool from the plurality of different types and sizes of tools;

FIG. 9 is a front elevational view of the selector means shown in FIG. 8 with parts broken away to reveal the operating mechanism and a portion of the selector control means;

FIG. 10 is an elevational view of a tool provided with a modified coding structure;

FIG. 11 is an elevational view of a tool provided with coding structure mounted directly on the shank of the tool for identifying the tool;

FIG. 12 illustrates a tool similar to that shown in FIG. 11 with the coding structure formed integrally with the shank of the tool;

FIG. 13 is an elevational view partly broken away illustrating the coding structure of FIG. 11 with the coding rings arranged in a different combination than that shown in FIG. 11 for identifying a different tool; and

FIG. 14 is an elevational view of a tool equipped with the coding structure shown in FIG. 12 and having the lands and grooves arranged in the combination for identifying the same tool that is illustrated in FIG. 13.

The present invention, when applied to tools, is adapted for use in effecting either visual or manual selection of a particular tool from a plurality of different types and sizes of material removing tools. It is also particularly well adapted for use in conjunction with automatic means for effecting the selection of a particular type and size of tool from the plurality of many types and sizes of tools.

In accordance with present production methods, it is common practice to effect a number of changes of different types of tools in a single machine to cut the cost of manufacture and expedite production. The present invention lends itself to the rapid manual or automatic selection of the desired tool or tools to reduce to a minimum the required time in effecting tool changes.

The present invention contemplates the use of a variety of identifying means on the several individual tools to designate both size and type of tool and it is to be understood that the forms of the present invention shown in the accompanying drawings are for illustrative purposes only.

The different identifying means for each of the various types and sizes of tools may be that of contour, external...
formations, suitable lands or grooves or combinations thereof to constitute coded information for identifying the various sizes and types of tools.

Referring more particularly to FIGURE 1 of the accompanying drawing, a toolholder 10 preferably of cylindrical form includes an axial bore 11 provided with threading 12 adapted to receive the positioning plug 13 against which the inner end of a tool 14 is positioned. The inner end of the axial bore 11 is contiguous with a bore 15 which extends forwardly and outwardly to form a conical opening adapted to receive the segments of an axially split sleeve 16 which has the identical taper as that of bore 15. The outwardly facing bore 15 terminates in a cylindrical cavity 17 provided with internal threading 18 adapted to receive the threaded portion of a tool clamping ring 19. The forward portion of the split sleeve 16 is provided with a circumferentially extending groove 20 for receiving a snap ring 21 which also engages the clamping ring 19 to couple these two members for conjoint action. The forward end of each of the parts of the split sleeve 16 are of tapered form adapted to be contacted by the inner surface of a tapered compression ring 22 seated in a socket 23 formed in the tool clamping ring 19. An axially disposed bore 24 in the ring 19 serves as an opening through which the shank of the tool may be inserted. After the tool has been inserted in the holder 10, the clamping ring 19 is tightened in the toolholder 10 to force the split sleeve 16 rearwardly into the bore 15 to cause the walls of the bore 15 to compress the walls of the split sleeve 16 about the shank of the tool 14 for retaining the tool in fixed operating position therein.

The rearward portion of the toolholder 10 is of cylindrical form that is receivable in the spindle of the machine. The holder 10 includes an enlarged cylindrical portion 25 terminating the ring 19 and serves as an opening through which the shank of the tool may be inserted. A flange 27 having a machined front face 28 is disposed at the inner end of a machine cylindrical surface 29. A plurality of rings 30 and 31 are adapted for slidably receipt on the machined cylindrical portion 29 of the toolholder 10 to provide the identifying means for a particular tool 14, which in the present instance is a particular size of drill.

The exemplary embodiment provides a coding based on the binary numbering system in which each digit of the binary number is either "off" or "on" as represented by a "0" or a "1" as illustrated in this description. The illustrated toolholder 10 is provided with five annular bits on the cylindrical surface 29 with each bit representing one digit of the binary numbering system. Each bit is spaced from the succeeding bit by an annular groove or space 30', as shown in FIG. 1. The proper coding for identifying the particular tool 14 in the toolholder 10 is established by placing either a large diameter ring 30 or a small diameter ring 31 in the designated bit locations on the cylindrical surface 29. If the bit is occupied by a large diameter ring 30, the digit of the binary number which that bit represents is "on" as indicated by the numeral 1. On the other hand, if the bit is occupied by a small diameter ring 31, the digit of the binary number which that bit represents is "off" as indicated by the numeral 0. Accordingly, the large diameter rings 30 on the cylindrical surface 29 indicate the numeral "1" for the corresponding digits of the binary number while the small diameter rings 31 on the cylindrical surface 29 indicate a "0" for the corresponding digits of the binary number.

Although the small diameter rings 31 constitute a part of the tool identifying coding by representing the numeral "0" when they are located in the bit positions on the cylindrical surface 29, they also serve as spacers for forming the annular spaces 30' between each of the bit positions. Thus, a small diameter ring 31 will be placed between positions of the bit positions on the cylindrical surface 29 wherein it serves solely as a spacer for spacing the rings 30 and 31 that are located in the adjacent bit positions. The rings 30 therefore serve as a spacer when located between the bit positions, but constitute a part of the identifying coding when they are in any of the five bit positions on the cylindrical surface 29.

The series of rings 30 and 31 are retained in abutting face to face relationship on the surface 29 of the holder 10 by the positioning plug 13 in an axially internally threaded clamping ring 32 on the threading 26. The five digits of the binary numbering system represented by the five bits on the cylindrical surface 29 provide for all numbers up to thirty-one so that thirty-one different tools can be identified by thirty-one different combinations of rings 30 and 31 in the bit positions on the surface 29. Under this arrangement, the binary number 00001 will identify tool No. 1, while the binary number 11111 will identify tool No. 31. The peripheral surfaces of the rings 30 and 31 in the bit positions on the surface 29 serve as coded radially extending projections to respectively designate the digits "1" and "0" of the binary system to constitute a coding for identifying each of the tools contained in the respective toolholders 10.

As fully described in U.S. Patent No. 3,052,011 issued to Wallace E. Brainard et al., on September 4, 1962, the toolholders 10 include a selector 33 mounted on and connected to a rotating member 62 of a tool storage magazine 35. The coding formed by the rings 30 and 31 on the tools in the sockets 61 are read by a selector or tool indicator 33 illustrated in FIGS. 7, 8 and 9. The selector 33 includes a stationary selector 33 that is yieldeably urged forwardly and are engaged by the rings 30 or 31 as the several tools are moved past the fixedly positioned selector 33 under the rotating movement of the member 62. Each of the fingers 34 is carried by a separate rod 36 which is surrounded by a spring 37 that urges the fingers 34 toward the rings 30 and 31 on the several toolholders 10. The inner end of each rod 36 is connected to a movable contact bar 38 of a switch 39 which is a double throw switch provided with two stationary contacts 40 and 41 that form part of an electrical system upon which is impressed the number of the particular tool desired for the next successive machining operation.

As each of the toolholders 10, removably supported in the magazine 35, pass the fixedly positioned selector 33, the rings 30 in the bit positions on the surface 29 of successive toolholders 10 are sensed by the selector 33 and urge the fingers 34 in the selector 33 rearwardly against the pressure of their cooperating springs 37 to actuate the associated switches 39. The rings 31 are not of a sufficient diameter to engage the fingers 34 for actuating the switches 39. Accordingly, when a bit position on the surface 29 is occupied by a ring 30, the corresponding switch 39 which represents the same digit of the binary number is actuated as the toolholder passes by the tool selector 33. On the other hand, when the same bit position is occupied by the smaller diameter ring 31, the corresponding switch 39 in the selector 33 is not actuated when the toolholder is moved past the selector and the switch remains in its normal position.

Since the toolholders 10 are each provided with five bit positions for identifying thirty-one different tools, the selector 33 is likewise provided with five switches 39 that cooperate with the respective five bit positions on the toolholders. The rings 31 serve as actuators for actuating the five switches 39 in different combinations depending upon the arrangement of the rings 31 on the surfaces 29 of the different toolholders 10. The number of the desired tool is first impressed on the electrical control system (not shown), and when the switches 39 are actuated in the combination which represents the same number that was impressed upon the control system, the rotation of the tool storage member 62 is automatically stopped with the specified tool in position to be withdrawn from the tool storage magazine and transferred to the spindle of the machine.
Referring more particularly to FIG. 8, it will be noted that the four rear fingers 34 of the selector 33 are in contact with four rings 30 while the front finger 34 is in contact with a ring 31. The binary number for the particular contact 33 is represented by the removable rings 30 and 31 in FIG. 3. By varying the position and relationship of the rings 44 and grooves 42 on toolholder 10', any binary code number may be produced that is capable of being decoded by the removable rings 30 and 31 of toolholder 10 in FIG. 3.

FIG. 10 of the drawings depicts a modified embodiment of the tool coding means illustrated in FIG. 1. It will be noted that the coding means comprises recesses 47 integrally formed in the shank of a tool 50, at designated locations referred to herein as bits, rather than placing the coding means on the toolholder as illustrated in the prior embodiments. It should be noted further that the absence of a recess or recesses 47 at the bit locations in the shank of the tool is also a part of the coding means. Therefore, the presence or absence of recesses 47 at the designated bit locations on the shank of the tool 50 determines its identifying code number. The tool 50 may be stored in a storage medium in a manner that it can be carried past a tool selector that will read the code on the tool 50. To read the code on the tool 50 the several plungers 51 of a tool selector (not shown) similar to selector 33 of FIG. 8 are brought in contact with the cooperating bits on the tool 50 that are designated to contain the coding means by the absence or presence of a recess 47. When the plungers 51 are in contact with the recesses 47, the digit "0" of the binary coding is indicated and when the plungers 51 are in contact with the absence of the recess 47, the digit "1" is indicated. In FIG. 10, the binary code number "01010" is designated by the recesses 47 and the shank of the tool 50. By varying the position and relationship of the recesses 47, any binary code number may be produced on the tool 50 that is capable of being produced on the toolholder shown in the other embodiments. Since the coding recesses are provided on only one side of the tool 50, the tool may be conveniently positioned in the storage medium by means of the flats 52 to properly locate the bit areas of the coding means with respect to the plungers 51.

FIGS. 11, 12, 13 and 14 illustrate the tool coding means applied directly to tools for identifying the type and size of the tool. FIG. 11 depicts a drill 60 of a size that is different from the size of the drill 14 shown in FIG. 1. The tool 60 is provided with the same components 47 of cylindrical form that is receivable in the spindle of a machine. The coding means are affixed directly to the shank or body 68 of the tool at designated locations in a manner to be operable to cast with the selector or tool indicator 33 shown in FIG. 1.

In order to locate the coding means in a designated location, a positioning flange 64 having a machined front face 66 is mounted on the cylindrical body portion 68 of the tool adjacent to the working portion 69 of the tool. The positioning flange 64 is affixed to the body of the tool in the desired position by means of a set screw 71 which is threadedly disposed in a suitable radially threaded opening 72 formed in a rearwardly extending collar portion 73 integrally formed with the positioning flange.

The identifying coding on the tool 60 shown in FIG. 11 comprises a plurality of rings 90 and 91 that slide onto the shank 68 of the tool 60 and are secured in position, in abutting face to face relationship between the flange 64 and a clamping ring 74 that is fixed on the shank 68 by a set screw 76. The rings 90 and 91 are very similar to the rings 30 and 31 that were described as applied to the toolholder 10 shown in FIG. 1, but are of a reduced diameter to adapt them for mounting directly on the shank of the tool 60, as shown in FIG. 11, instead of on the toolholder in the manner depicted in FIG. 1. The rings 90 are of a larger diameter than the rings 91 so that they function in the same manner as the rings 30 to actuate the switches 39 in the selector 33.
through engagement with the fingers 34 as previously described. The rings 91, like the rings 31, are not of sufficient diameter to cause the actuation of the switches 39 as the tool 60 passes the selector or reading head 33. Such difference in the diameters of the rings 90 and 91 results in the rings 90 forming lands along the coding area on the Shank 68 of the tool 60 and the smaller diameter rings 91 produce grooves 90' interpolated between the lands in different combinations to constitute the coding for identifying the different tools.

The tool identifying coding shown in FIG. 11 is further distinguishable from the coding depicted in FIGS. 1 to 4 in that it includes ten bits or columns that represent ten digits of the binary number system in lieu of the five bits that are provided in the binary coding on the toolholders in FIGS. 1 to 4. As a result, the exemplary embodiment depicted in FIG. 11 has the capacity to identify 1023 different tools as compared to the capacity to identify thirty-one different tools for the five digit binary system. This substantial increase in capacity is achieved without increasing the length of the coding assembly by eliminating the spaces between adjacent bits. Thus, in the embodiment of FIG. 1, the small diameter rings 31 are utilized not only as coding elements, but also as spaces on the surface 32 to form spaces 30 between the several bits. Such spaces are eliminated in the coding structure of FIG. 11 so that the rings 91 do not at any time function as spacers but serve solely as coding elements. The ten bits are directly adjacent to each other with no space between them, and when a ring 91 is mounted on the Shank 68 of the tool 60, it is always in a bit position between the flange 64 and the clamping ring 74 to represent the numeral "0" of the binary number that identifies the tool.

The rings 90 and 91 are arranged on the Shank 68 of the tool 60 in FIG. 11 to indicate the binary number 0010010101 which may be expressed in the decimal system as number 149.

The tool 60 may be stored in a storage medium, such as the magazine 35 shown in FIG. 7, so that it can be moved past the tool selector 33 for reading the coding in the manner previously described. Therefore, the coding means are directly to the tool must be disposed on the tool so as to be operable to actuate the fingers 34 of selector 33 as the tool moves past it. To this end, an axial end face 75 of the collar 73 is provided with a machined surface that is cooperable with the end faces of the storage sockets 61 in the magazine 35 so as to establish the location of the rings 90 and 91 of the positioning flange 64 relative to the associated tool. With this arrangement the coding means will be disposed in position to actuate the selector 33 as the tool moves past it.

Referring more particularly to FIG. 12 of the drawings, there is shown a modified form of the tool coding means illustrated in FIG. 11. It will be noted that the tool illustrated is in the form of a drill 60' which is the same type and size as the drill 60 illustrated in FIG. 11. The tool 60' bears the identical coded information on its periphery as is presented by the removable rings 90 and grooves 90' on the periphery of the tool 60 in FIG. 11. However, the axially spaced rings or annular radial projections 90A are integrally formed on an enlarged diameter portion 78 of the Shank 68' on the tool 60' adjacent to its working portion 69'. Such lands or rings 90A are produced by forming grooves 90A' on the enlarged portion 78 of the tool 60'. Accordingly, the lands or rings 90A are permanently fixed on the Shank 68', and by varying the position and relationship of the projections 90A and grooves 90A', the desired code can be affixed to the tool 60'. The rings 90A and grooves 90A' serve the same purpose as the removable rings 90 and grooves 90' of the tool 60 in FIG. 11. Thus the enlarged diameter portion 60' is provided with ten bits representing the respective ten digits of a binary number. The annular projections 90A indicate the numeral "1" for the digit of the binary number that is represented by the bit in which the projection 90A is located. On the other hand, a groove 90A' in a bit on the enlarged diameter portion 78 indicates a "0" for the corresponding digit of the binary number. The axial end face 75' of the enlarged portion 78 of the Shank 68' is likewise provided with a machined surface which serves the same purpose as the machined surface 75 of the positioning flange 64 associated with the tool 60 in FIG. 11. Thus, the machined surface 75' will effectively retain the tool 60' in the storage medium in position so that the integrally formed coding on the tool is disposed to actuate the tool selector as the tool 60' moves past the tool Shank that identifies the tool.

FIG. 13 illustrates an end mill 80 of cylindrical form having a cylindrical Shank portion 81 receivable in a working spindle of a machine and being provided with the same coding structure as the drill 60 in FIG. 11. Since the tool 80 is of a different size and type than the drill 60 shown in FIG. 11, the coding must be adapted correspondingly to identify the different tool. Accordingly, the rings 90 and 91 are arranged in such a manner as to indicate the binary code number 1000101110 which is expressed in the decimal system as number 358. The rings 90 and 91 are mounted on the tool 80 by being slid onto a Shank 81 and are secured at the predetermined location in abutting face to face relationship between the positioning flange 64 and the clamping ring 74 in the same manner as described above in connection with the tool 60 depicted in FIG. 11.

The end mill 80' illustrated in FIG. 14 is identical to the end mill 80 shown in FIG. 13, except that it is equipped with a different coding structure. Instead of the different diameter rings 90 and 91 that slide onto the Shank of the tool to form the coding as illustrated in FIG. 13, the identifying coding structure is formed integrally with the Shank 81' of the tool 80' depicted in FIG. 14 in the same manner that the coding is formed on the Shank 68' of the drill 60' that is shown in FIG. 12. In the embodiment illustrated in FIG. 14, axially spaced annular projections or lands 90A are formed on an enlarged diameter portion 78' provided on a Shank 81' of the end mill 80'. The integrally formed coding on the end mill 80' is provided with ten bits in accordance with the binary coding on the tool 80 shown in FIG. 13 and the lands 90A cooperate with grooves 90A' to form the binary coding in which the lands 90A represent the numeral "1" of the binary number for the digit which is represented by the particular bit in which the appearance of the land 90A indicates the numeral "0" of the binary number in the bit that is represented by the bit in which they are located on the enlarged diameter portions 78'.

Since the end mill 80' is the same as the end mill 80 except for the construction of the coding, the radial projections 90A and grooves 90A' are arranged on the tool 80' to correspond with the arrangement of the large diameter rings 90 and the small diameter rings 91 respectively on the tool 80 shown in FIG. 13 to indicate the same binary number for identifying the tool. Accordingly, the coding on the tool 80' in FIG. 14 represents the binary number 1000101110 which is expressed decimally as number 358. It is apparent that by varying the position and relationship of the projections 90A and grooves 90A' on an integrally formed coded tool, any binary code number may be produced that is capable of being produced by the removable rings 90 and 91 that are shown assembled to the tools 60 and 80 depicted in FIGS. 11 and 13 respectively.

While the present invention has been described in detail as applied in conjunction with the use of the binary coding as disclosed in the previously mentioned Brainard et al. patent, it is to be understood that such use merely affords an excellent example of its adaptability in the automatic selection of one particular tool of proper size
and type from a plurality of different sizes and types of tools.

From the foregoing detailed description of the present invention, it will readily be understood that a simple and effective means has been provided by which the selection of a particular type and size of tool may be quickly and easily accomplished from a plurality of many different types and sizes of tools.

Although the illustrative embodiment of the invention has been described in considerable detail for the purpose of disclosing a practical operative structure whereby the invention may be practiced advantageously, it is to be understood that the particular apparatus described is intended to be illustrative only and that the novel characteristics of the invention may be incorporated in other structural forms without departing from the spirit and scope of the invention as defined in the subjoined claims.

The principles of this invention having now been fully explained in connection with the foregoing description, we hereby claim as our invention:

1. In a tool bit body having a portion adapted to be gripped by a toolholder, a portion adapted to perform a work operation and a code element receiving portion:
   a plurality of first code elements of uniform size and each respectively having one coded value;
   a plurality of second code elements of a uniform size different than the size of said first elements with each of said second elements respectively having different coded values, said code elements being adjustably positionable on the receiving portion; and,
   means for securing a predetermined number of said first and second elements to said receiving portion in selected relationship for cooperating therewith to provide a distinct configuration representing a specific coded identification equivalent to the cumulative value of said elements for identifying the associated tool.

2. A tool bit element comprising a work performing portion and a body, part of said body being adapted to be gripped by a toolholder:
   a plurality of external rings mounted on the body, said rings having different outside diameters;
   means for positioning said rings in various selected arrangements, each of said rings constituting one digit of a binary code structure with the size of the ring determining the value of the digit for automatically identifying the tool.

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