CROSS DRILLING ATTACHMENT FOR AUTOMATIC SCREW MACHINES

Fig. 1.

Fig. 2.

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To all whom it may concern:

Be it known that we, CHARLES J. GENDREAU and JOHN L. SARVY, citizens of the United States, and residents of the city of Rochester, in the county of Monroe and State of New York, have invented a new and useful Cross-Drilling Attachment for Automatic Screw Machines, of which the following is a specification.

This invention relates to improvements in automatic screw machines, and more particularly to a cross drilling mechanism or attachment for such machines, by means of which transverse holes may be automatically drilled in the article or product as one of the regular operations of the machine.

It is found in practice that if transverse holes are made in screw machine products, by a separate operation, the cost of manufacturing is greatly increased, and in some instances, the cost of the drilling alone is as great as the entire cost of making the article on the screw machine.

It is desirable, therefore, to perform a cross drilling as one of the regular automatic operations of the machine, and the primary object of our invention is to provide a simple and efficient cross drilling mechanism which can be used to perform the drilling operation automatically as the article is being worked up on the screw machine and which will perform this drilling operation quickly without delaying other operations.

A further object is to provide a cross drilling mechanism comprising few parts, and which may be used or not, as required, without impairing the efficiency of the machine.

Other detail objects and advantages of the invention will be in part obvious and in part pointed out hereinafter.

In describing the invention in detail, reference will be made to the accompanying drawings, in which is illustrated one specific embodiment of our invention, in which like reference characters designate corresponding parts in the several views, and in which:

Figure 1 shows a partial outline of one type of an automatic screw machine, together with some of its operating parts, having a cross drilling mechanism embodying our invention applied thereto;

Fig. 2 is a fragmentary end view of the screw machine looking at the righthand end of Fig. 1;

Fig. 3 is a diagrammatic view, partly in perspective, with some parts broken away and spread apart for clearness, and illustrating in a simplified manner the principal operating parts of our cross drilling mechanism;

Fig. 4 is a fragmentary section showing the brake, and

Fig. 5 is a fragmentary view illustrating the adjustable support for the drill and its operating motor.

For the purpose of illustrating the functions and operations of our invention, we have shown in the accompanying drawings one specific form arranged to be applied to a multiple spindle screw machine of a well known type; but it should be understood that by making appropriate changes in mechanical details, our invention may be applied to other types and makes of screw machines. Since the construction and operation of automatic screw machines in general are well known, it has been deemed unnecessary to show or describe many features of the construction and operation of such machines, attention being limited to those parts directly involved in the operation of our cross drilling mechanism.

The cross drilling mechanism, or so-called attachment, comprises in general a drill constantly driven by suitable means, preferably an electrical motor, mechanism for feeding and withdrawing the drill, and suitable clutch and brake devices for stopping and holding the stock while the drilling is being done, these parts being driven synchronously with the movement of the machine. Referring to the drawings, the drill 1 is mounted in a chuck 2 of the usual construction secured to the armature shaft 3 of a suitable electric motor M which is constantly operated by current from some suitable source (not shown). This motor M is supported on a cross slide 4 with a connection permitting the motor and the drill to be
adjusted back and forth at right angles to said slide, so that the drill may be spotted on the stock at the desired point. This adjustable connection (see Fig. 5) consists of a gibbed plate 5 to which the motor frame is fastened by screws 6, and which is guided in an undercut groove or channel in a block 7 fastened to the cross slide 4. Another block 8 fixed at one end of the block 7 carries an adjusting screw 9 which bears against the plate 5 and thus provides means for moving the motor transversely of the cross slide 4. The cross slide 4 is guided in a bracket 10, such as commonly used on screw machines of this type, and this bracket is arranged in the usual way (not shown), so that it may be adjusted lengthwise of the machine to permit holes to be drilled at the desired point in the stock.

Cross slide 4 has a pin 11 fixed thereto which extends through a clearance slot in the bracket 10 and loosely through a hole in the upper end of a lever 12, said lever being journaled near its middle on a pin 13 fastened in the jaws of a fixed bracket 14. The lower end of the lever 12 carries a short fixed pin 15 which cooperates with a pair of cams 16 and 17 fastened to a plate 18 attached to the usual cam shaft 19 of the machine, so that the lever 12 may be rocked and the cross slide 4 advanced and retracted in timed relation to the other operations of the machine, in the manner more fully explained hereinafter.

The clutch device for stopping rotation of the stock comprises a shifter 20 which is adapted to cooperate with two flanges on a clutch collar 21, commonly provided on each spindle S of machines of the type illustrated. The movement of this clutch collar 21 lengthwise of the spindle S serves to connect and disconnect this spindle from the driving mechanism in the manner characteristic of this type of machine, thereby stopping rotation of the spindle and stock. The clutch shifter 20 is carried at the upper end of a movable lever 22 journaled near its middle on a pin 23 in a fixed bracket 24, so that said lever 22 may swing lengthwise of the machine. The lower end of the lever 22 carries a pin 25 operating with cam strips 26 and 27 on a cam drum 28 which is fastened to the main cam shaft 19.

The brake device for holding the spindles S and the stock against rotation while the drilling is being done, comprises a brake shoe 30 which cooperates with a flanged collar 29 fastened to the spindle S. This brake shoe 30 is preferably provided with a friction lining of suitable material. The brake shoe 30 is pivotally connected to a plunger 31 (see Fig. 4), which is provided with an integral collar 32 slidably mounted in a recess 33 in the upper end of a brake lever 34. A compression spring 35 in the recess 33 bears against the collar 32 and presses the brake shoe 30 outward, the outward movement of the plunger 31 being limited by adjustable locking nut 36. The brake lever 34 is fulcrumed near its middle on a pin 37 secured in two ears of the fixed bracket 24, so that said lever may swing crosswise of the machine and move the brake shoe 30 toward and away from its cooperating collar 29. The lower end of the brake lever 34 is rounded and cooperates with a cam strip or ridge 33 fastened to the end of the cam drum 23 by bolts 39.

Operation: The operation of the screw machine itself, being well known, needs no explanation. In multiple spindle machines of the type to which we have illustrated our invention applied, the spindles S are rotated or indexed at the proper times to different positions for performing different operations. In one of these positions (see Fig. 2), the cross drilling operation is performed by our improved mechanism. The parts have been shown in Figs. 1 and 3 in the positions which they assume just after the spindle S has been indexed, ready for the drilling operation. Taking up from this point the steps in the cycle of the cross drilling operation, as the main cam shaft 19 revolves in the direction indicated by the arrow a, the beveled shoulder of the cam strip 26 engages pin 25 and shifts the clutch lever 22 to throw clutch collar 21 out and dis-connect the driving mechanism from the spindle S. The lower end of the brake lever 34 now engages the curved end of the cam strip 33 and is thus swung out, pressing the brake shoe 30 against the collar 29 and quickly stopping rotation of spindle S and firmly holding it against movement. The cam 16 on the plate 18, which engages pin 15 on the lever 12, and this edge being relatively abrupt, the lever 12 is rocked quickly, thereby advancing cross slide 4, together with the motor M and the drill 1 carried thereby, to bring the drill point against the stock. Cross slide 4 and the drill 1 are now gradually advanced by the curved edge of the cam 16, this cam being suitably shaped to advance the drill at the appropriate rate. The speed of the drill and the rate at which it is fed are, of course, selected so as to obtain the quickest drill operation consistent with wear on the drill, hardness of the stock and the like. When the drilling is completed, the cam 17 picks up the pin 15 and retracts cross slide 4 and withdraws the drill. The cam 17 is preferably shaped so as to make this withdrawing movement as rapid as practical. In this connection it should be noted that the cams 16 and 17 may have to be changed slightly in shape for the best results with different kinds of stock, dif-
different sized holes, and the like. After the drill is withdrawn, the brake operating lever 35 leaves the cam 32, and the spring 30 kicks off the brake shoe 30. The shoulder on the cam strip 27 now engages the pin 25 and rocks the clutch lever 22 to throw in the clutch. The cycle of the drilling operation is then completed, and the spindle 8 is then rotated by the indexing mechanism in the usual way, and another spindle 8 takes its place, the clutch shifter 20 slipping between the flanges of the clutch collar 21 of the next spindle, and the brake shoe 30 likewise cooperating with the collar 29 on this next spindle, so that everything is in position ready for the next drilling operation upon the stock carried by this next spindle.

It will be evident that our improved cross-drilling mechanism greatly decreases the cost of production of articles requiring the drilling of transverse holes therein, such as jaw pins with cotter pin holes, and the like. The various cams controlling the operation of the cross-drilling mechanism are shaped and adjusted in practice to obtain the several steps in the cycle of the cross-drilling operation in the proper sequence and without any intervening idle periods. The motor M driving the drill is preferably a variable speed motor of any of the well known types, in order that the speed of the drill may be varied to obtain the quickest and most effective drilling, in accordance with the size and length of the hole and the character of the stock. To attain the most efficient results it is evident that the time of operation of the cross-drilling should be no longer than the time required for the longest operation upon the stock in the other spindle positions, and we find that in most classes of work, this desirable result can be obtained, so that the cross-drilling operation, being accomplished in an indexed position of the spindle carrier, which is commonly inactive, does not impair the efficiency or rapidity of the machine. Even where the other operations of the machine are very simple and require a little less time than the cross-drilling operation, there is still a great saving, because the cost of performing the cross-drilling by a separate operation may be equal or even double the cost of shaping up the article. The drill is preferably driven by an electric motor, as shown, rather than by a belt or the like, in order that the drill may be positively rotated as it is advanced. Otherwise, with a belt drive, for example, the belt may slip and the drill being fed continuously, is likely to jam and break. Also, the use of an electric motor for driving the drill obviates the difficulty of providing an efficient and reliable drive which will permit the necessary adjustment for spotting the drill correctly, and which will not interfere with the regular operations of the machine. When the cross-drilling mechanism is not needed, it may be readily thrown out of operation without interfering with the rest of the machine.

Obviously, various changes, additions or adaptations may be made in the specific embodiment of our invention shown and described, and we desire to have it understood that this particular embodiment is merely illustrative of the idea of means underlying our invention, and does not exhaust the various forms which may be advantageously employed in practice.

What we claim as new and desire to secure by Letters Patent of the United States, is:

1. A cross-drilling mechanism for automatic screw machines comprising a drill adjustably mounted on a cross slide, an electric motor on the cross slide for driving the drill continuously in any of its adjusted positions and means for advancing and retracting said drill in synchronism with the regular operations of the machine.

2. A cross-drilling mechanism for automatic screw machines comprising a continuously driven electric drill mounted on a cross slide, and means for advancing and retracting said drill in timed relation to the operating parts of the machine.

3. A cross-drilling mechanism for automatic screw machines comprising a drill mounted on a cross slide, an electric motor on the slide continuously driving the drill, means for quickly advancing the drill to its drilling position, gradually feeding the drill, and then quickly retracting it, all in synchronism with the operating movements of the machine.

4. A cross-drilling mechanism for automatic screw machines comprising a drill carried by a cross slide, an electric motor on the slide continuously driving the drill, clutch and brake devices for stopping and holding the stock, and means for advancing and retracting the drill, said devices and means being operated in synchronism with the regular operations of the machine.

5. A cross-drilling mechanism for automatic screw machines comprising a separate drill continuously driven by an electric motor adjustably mounted on a cross slide, means for stopping and holding the stock, and means for actuating said slide to advance, feed and retract the drill, the operation of both of said means being timed to occur at predetermined intervals in sequence with the regular operations of the machine.

6. In a cross drill attachment for automatic screw machines comprising, a drill chuck and shaft adjustably mounted on a cross slide and adapted to receive drills of different sizes, a variable speed electric motor for positively and continuously driving the shaft in any one of its several adjusted positions, and means for advancing and re-
tracting the slide in synchronism with the operation of the machine.

7. In a cross drill attachment for automatic screw machines comprising, a drill chuck and shaft mounted on a cross slide and adapted to receive drills of different sizes, a variable speed electric motor for positively and continuously driving the shaft, and means for advancing and retracting the slide in synchronism with the operation of the machine.

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