Oct. 20, 1936. M. A. WEST 2,058,197

SCREW

Filed Dec. 12, 1935

Fig. 1

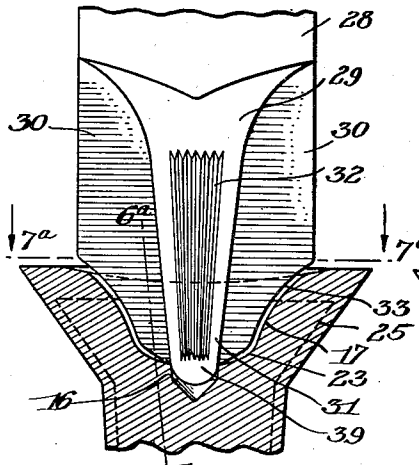


Fig. 4

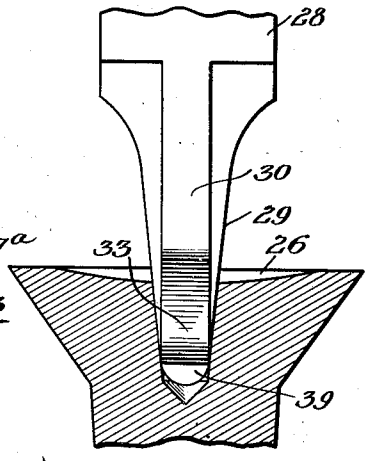


Fig. 9

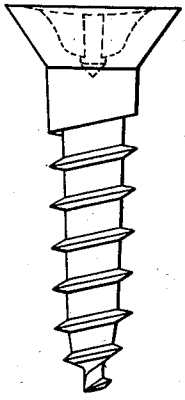


Fig. 2

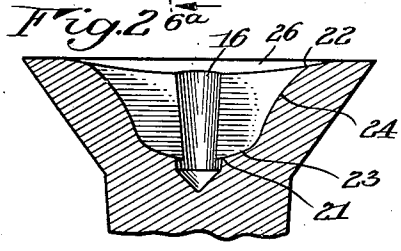


Fig. 5

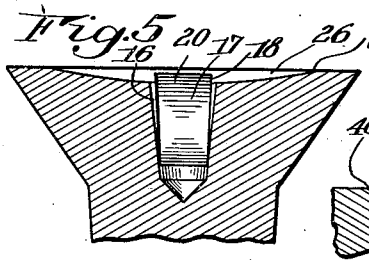


Fig. 10

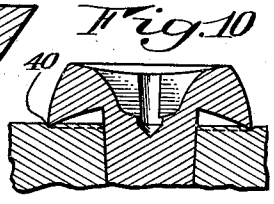


Fig. 3

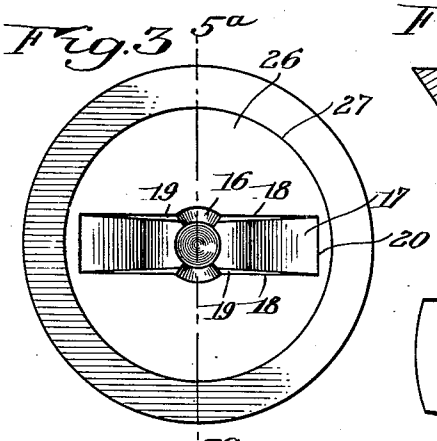


Fig. 6

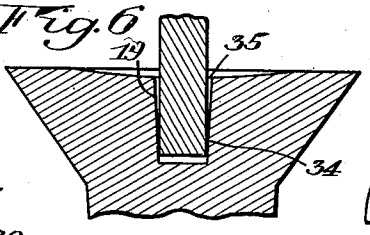


Fig. 11

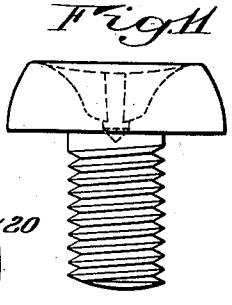


Fig. 7

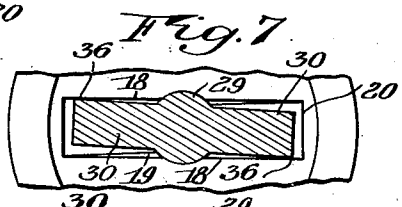
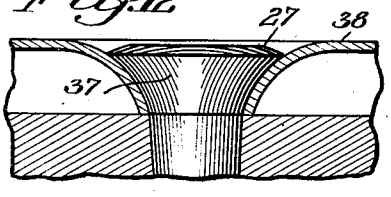


Fig. 12



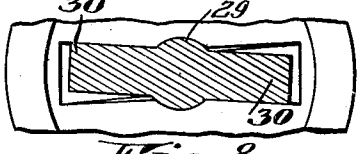


Fig. 8

Fig. 13.

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Patented Oct. 20, 1936 2,058,197

UNITED STATES PATENT OFFICE

2,058,197

SCREW

Maxwell A. West, Portland, Oreg.

Application December 12, 1935, Serial No. 54,100

8 Claims. (Cl. 85—45)

This invention relates to screws, and, more particularly, to the portions of the screw head which cooperate with the driver bit and by means of which the driver engages and turns the screw, one object of the invention being to provide cooperating portions of the character described of improved and more efficient construction.

Another object is to provide driving portions on the screw capable of being more readily engaged by and maintained in engagement with the driver during the driving operation.

Another object is to provide such parts on a screw so constructed as to facilitate the application of a larger turning force without danger of disengaging or damaging the driving parts.

Another object is to provide cooperating driving portions so constructed that the driver may be employed to effectively direct and control the position of the screw.

Another object is to provide such a construction of the above parts as will afford maximum strength to the head of the screw.

To these and other ends the invention resides in certain improvements and combinations of parts, all as will be hereinafter more fully described, the novel features being pointed out in the claims at the end of the specification.

In the drawing:

Fig. 1 is a side elevation, partly in section, showing a screw embodying the present invention with a driver bit applied thereto;

Fig. 2 is a sectional view of the screw head as shown in Fig. 1, with the driver removed;

Fig. 3 is a top plan view of the screw head;

Fig. 4 is a side elevation similar to Fig. 1 but in a plane at right angles thereto;

Fig. 5 is a sectional view of the screw head as shown in Fig. 4 with the driver removed;

Fig. 6 is a sectional elevation on the line 6*a*—6*a* in Fig. 1;

Fig. 7 is a plan view partly in section on the line 7*a*—7*a* in Fig. 1, showing the driver in active or turning relation to the screw;

Fig. 8 is a view similar to Fig. 7 but showing a modified form of screw slot;

Figs. 9 to 12, inclusive, show the application of the invention to different forms of screws; and

Fig. 13 shows a modification in which the taper of the side walls of the screw slots is slightly increased to cooperate with a slight taper of the side walls of the wings of the driver.

The same reference numerals throughout the several views indicate the same parts.

In the type of screw and screw driver heretofore commonly employed, the screw has a slot milled or otherwise formed diametrically from side to side through the top of the head, and the driver bit has a transverse and substantially straight edge for engagement in the screw slot. It is a matter of common experience in the art that such construction embodies serious defects, such as the fact that it is difficult under some circumstances to quickly engage the driver edge in the slot, and there is a tendency, when engaged, for it to slide longitudinally out of the slot and mar the work. If the driver is tipped a little out of the axis of the screw, its edge tends to rise out of one end of the screw slot and act as a cam to disengage the driver altogether and, in so doing, burring and injuring the screw. There is, furthermore, very little control by the driver of the position of the screw. The slot traversing the full width of the head, has seriously weakened it and resulted in frequent splitting off of one-half the head. While various modified constructions have been suggested to overcome such defects, they have been only partially successful and open to other objections, and it is the purpose of the present invention to provide a successful solution of such difficulties.

This application is a continuation in part of my application, Serial No. 759,026, filed December 24, 1934, for Screw and screw driver therefor.

In the embodiment of the invention herein shown and in said prior application, by way of illustration, there is formed in the head of the screw a driving recess comprising as one of its components, a relatively small socket-like opening as shown extending down the screw axis from the face or top of the head to about the junction of the head with the shank of the screw, so that the socket lies substantially in the larger head portion without weakening the shank. This socket preferably has outwardly or concavely curved walls and may be generally round in cross-sectional shape, although it is recognized that various other shapes may be employed to afford a socket-like opening. It is preferably tapered slightly inwardly as shown to decrease in width toward its bottom, and it is, in fact, preferred to use, and the drawing shows, a substantially conical socket 16, to be closely engaged by a corresponding tapered body portion on the driver bit, as hereafter described, and serving to locate and hold the driver accurately and securely centered in the screw recess.

To afford the main driving engagement, the driving recess in the screw head comprises also a plurality of slots of less width than the socket 16 and extending outwardly from the tapered

sides of the socket for engagement by corresponding wings on the driver bit. Such slots are shown at 17, each having side walls 18 which are spaced apart and preferably parallel with each other in planes transverse to the axis of the screw, as shown in Figs. 3 and 7. These side walls 18, however, are preferably inclined slightly toward each other in a downward direction as shown at 19, for a purpose hereafter described. The slot side walls 18 are joined by an outer end surface or wall 20 which is preferably inclined outwardly and upwardly from adjacent the bottom of socket 16 as indicated at 21, to the top of the driving recess at 22, terminating at a substantial distance inwardly from the periphery of the head. While this outer slot wall may have various forms, it is preferred to employ a smoothly or continuously curved shape, so as to avoid sharp corners which might tend to pry the driver out of the recess in the screw when tipped out of the screw axis. Preferably also the outer slot wall 20 is curved in a direction which is first mainly outwardly as at 23, and then mainly upwardly as at 24, to afford substantial lateral width for the slot adjacent its bottom and to generally parallel the outer wall of the screw head without approaching it near enough to seriously weaken the head.

It is preferred to employ, and the drawing shows the slots 17 extending outwardly from two opposite sides only of socket 16, rather than a larger number of slots which would tend to excessive displacement of metal and weakening of the head of the screw, particularly in the area between adjacent slots to which the turning force is mainly applied. Such a construction also permits the use of slots of substantial lateral width continued close to the axis of the screw, as a further element of strength, and, of course, such a construction is easier to manufacture than one having a larger number of slots.

The dotted outline 25 in Fig. 1 of a screw of smaller size, indicates that by using sockets 16 of the same size in a range of screws of different size, and forming the slots 17 of greater or less lateral extent to correspond with the size of the screws, such range of screws of different sizes may be used with a single driver bit which merely enters to a greater or less depth as the size of the screw and its driving recess may require.

To facilitate the engagement of the driver bit, the top or face of the screw head is preferably dished somewhat inwardly as indicated at 26, such shape being carried slightly beyond the outer ends of the slots 17, as shown, but terminated as indicatd by the circle 27, at some distance from the periphery of the screw head. This dished shape affords a self-centering action between the screw and driver, causing the latter to travel toward the center of the screw and its driving recess. Furthermore, it is a common practice to enter the screw in the work by striking its head with a hammer and the dished shape described prevents the hammer from striking the portion of the head in which the driving recess is formed, to protect it from the injury which is frequently caused by such hammering of the ordinary screw. The termination of the dish shape in spaced relation with the periphery of the head also tends to protect the peripheral edge from similar injury.

The driver shank is indicated at 28 as terminating in a bit comprising generally a central body portion or spine 29 for engagement in the screw socket 16, and opposed wings 30 for engagement in the screw slots 17. The body portion 29 conforms closely to the shape of the screw socket 16, being in the present instance substantially conical in shape and smaller at its outer end 31 as shown. The opposite sides of the body 29 may be formed with a relatively fine longitudinal fluting, or other roughening 32, and it will be understood that this body of the driver bit is adapted to be inserted longitudinally in and closely fit socket 16 of the screw, as shown, the roughening 32 being intended to assist the bit in tightly engaging the screw to drive it and also so that a screw may be placed on and carried by the bit as a holder for locating and starting the screw relative to the work. The extremity of the driver body 29 is preferably rounded as shown to form an extended blunt point adapted to slide down the dished head of the screw into its driving recess and socket. The bottom of the screw socket 16 is extended below the bottoms of the slots 17 to receive and clear this extension at the end of the driver body 29 as shown in the drawing.

The driver wings 30 each have opposite faces or walls which are preferably parallel with each other, and so spaced apart as to afford the desired thickness and strength. These wing walls are joined by an outer end surface or wall 33 inclined or curved from a point adjacent the lower end of the body in a direction first mainly outwardly and then mainly upwardly relative to the body 29, as shown, to conform generally with the shape of the outer end surfaces or walls 20 of the screw slots 17. The outer end surfaces or walls 33 of the driver wings are continued outwardly and upwardly to a point beyond the top of the head of the largest screw with which the driver is normally intended to be used, or at least far enough to afford the desired lateral extent and driving force, beyond which the outer wall of the wing is continued parallel with the driver axis until it joins its shank at the top of the body 29. The outer walls 33 of the wings of the driver bit are so shaped and dimensioned as to be of less length laterally in any given transverse plane, than the outer walls 20 of the screw slots 17, with the result that when the driver is fully seated in the screw, a clearance is provided between such outer walls of the wings and slots, respectively, as shown in Fig. 1. Such clearance not only avoids interference of these outer walls with each other during the driving operation, but also permits of some tipping of the driver during engagement with the screw without such contact of these outer walls as might tend to cam the driver out of the screw recess. The present invention thus overcomes the disadvantage of the screw and driver heretofore in use, namely, the tendency of the shoulders formed by the ends of the transverse driver edge, to cam the driver edge out of the screw slot, whenever the driver is slightly tilted. The relatively deep seating of the present driver bit in the screw recess also aids in overcoming the same difficulty.

The driver and screw are specially coordinated in shape to bring about concentration of the driving engagement and pressure below the tops of the slots in the screws. To this end, the side walls 30 of each driver wing are preferably made parallel, as stated, and the walls 18 of the screw slot 17 are tapered slightly away from each other in an upward direction, so that when the bit is inserted in the screw recess, these wall surfaces of the driver wings first engage closely the bottoms of the walls of the slots, as at 34, Fig. 6, leaving a slight clearance between the adjacent

walls at the top of the slots as at 35, Fig. 6. If such walls of each driver wing be tapered toward each other in the direction of the driver point, as shown in Fig. 13, then the side walls 18 of each slot in the screw may be given a greater degree of taper to maintain the same condition of initial engagement adjacent the bottoms of the walls of the slots in the screw and clearance adjacent their tops.

As the turning pressure is applied, the driver wings first press against the bottoms of the side walls of the screw slots, without engagement of the driver wings with the sides of the slots at the top or face of the screw head. Should the driving force be sufficient to cause the parts to yield, or the softer metal of the screw to be deformed, then the outer edges of the driver wings are brought progressively into more extended engagement with the walls of the screw slots, beginning as stated, adjacent their bottoms and working progressively upwardly, thus tending to equalize the pressure from bottom to top of the wings and slots, and if such contact of the driver wings is extended as far as the tops of the slot walls, as indicated at 36 in Fig. 7, the extent of surface engagement is amply sufficient to prevent any burring or other defacement of the tops of the slots at the face of the screw. If the side walls of the screw slots are flared outwardly as shown in Fig. 8, such progressive upward engagement of wings and slot walls will occur over the full lateral extent of the same, and not merely adjacent the edges of the wings as in Fig. 7. Consequently, the driver receiving recess at the face of the screw maintains its normal and efficient shape for engagement and operation by a driver bit, through long continued usage of the screw and the application of severe turning force.

Fig. 9 illustrates the application of the invention to screws the type adapted for use with wood or other materials, Fig. 10 shows its adaptation to a screw having rounded head and, if desired, with a downwardly projecting rim 40 on its under side for engagement with the work to take the place of a washer and enhance the appearance. Fig. 11 shows the invention applied also to a machine screw, while Fig. 12 illustrates the dishing of the face of the screw head, in conjunction, if desired, with an inward curvature of the under side of the head as at 37, to facilitate entry into wood and like materials and to conform with the curved sides commonly encountered where a hole for the screw is first punched through sheet metal work 38. It will thus be seen that the invention is applicable to many, if not all types of screws and elements of a like nature requiring the use of a driver to turn the same.

As well understood in the art such screws are commonly manufactured of metals of a relatively soft nature, such as soft steel, brass, and the like, and a driving recess of the above described character may be readily forged in the head by appropriate dies and standard manufacturing methods. The driver bit is of a character also which may be readily formed as by means of an ordinary and inexpensive drop forging operation, although, of course, other manufacturing methods may be employed in part or in whole.

In operation, the bluntly rounded end or key 39 of the driver is applied to the dished face of the screw head, either before or after the screw is started in the work. The bit key, sliding down the incline, in a self-centering action, readily finds the screw socket, or one of the screw slots which it follows into the socket. The bit turns until its wings register with and enter the slots in the screw, as the body of the bit enters the screw socket. Such engagement may be partially made with the driver at an inclination to the axis of the screw which, if not excessive, does not tend to cam the driver out of the screw recess in view of the general tapering of the cooperating parts downwardly and toward the screw axis.

As the conical body of the driver bit becomes fully seated in the socket of the screw, the parts are brought into precise axial alinement, with the wings of the bit first engaging with the bottoms of the walls of the slots in the screw, as indicated in Fig. 6. In this relation the driver takes effective grip upon and control over the screw and may be used to direct and maintain it in the desired direction relative to the work. The turning force is first applied, as described, at the bottoms of the side walls of the screw slots and thence progressively upwardly toward the face of the screw head, as the degree of the force may require. The substantial length of engagement of said parts affords ample bearing surface for the transmission of such forces, without deforming the screw recess at the face of the head or decreasing its continued efficiency for cooperation with the driver. Such secure engagement of the driver and screw reduces the force necessary to hold the parts in cooperation. The rapidity and certainty with which they may be engaged, with the other advantageous features described, particularly adapt the present invention for use with power operated screw drivers.

A screw constructed in accordance with the present invention is stronger than the above described variety heretofore in common use, because although the recess penetrates more deeply down the axis, it does not extend substantially beyond the head into the shank and leaves the entire periphery of the head uncut by a slot or nick, so that the head remains strongly united around its periphery and there is no tendency to split off a portion at one side of the slot as in the screw in common use. In the preferred form of the invention, with slots at two opposite sides only of the socket, the slots themselves may have long side walls extending closely adjacent the screw axis to afford maximum driving surfaces, and the central portion of the screw head is not cut and weakened to any greater extent than the type screw heretofore commonly in use. The driver bit is of such a nature that it may be easily manufactured by standard methods in a strong and durable form, of the usual hard steel, and a single driver is adapted for use with a wide range of sizes of screws.

It will thus be seen that the invention accomplishes the objects to be attained, and it is to be understood that the preferred embodiments described above are intended by way of illustration and not by way of limitation and that various modifications may be resorted to within the principles of the invention and the scope of the appended claims.

I claim:

1. A screw having a head formed with a driving recess comprising a relatively small driver holding socket having spaced opposing walls of substantially the shape of portions of a cone of relatively small apical angle, to receive and firmly hold a correspondingly shaped spine of a driver bit against relative movement so that said bit may be used to control and guide the position of the screw, and a pair of driving slots extending outwardly and oppositely from said socket and

each having side walls and an outer end surface with said end surface inclined first mainly outwardly and then mainly upwardly from adjacent the bottom of said socket toward the top of said recess to provide broad driving surfaces adjacent the bottoms of said slots.

2. A screw having a head formed with a driving recess comprising a relatively small driver holding socket having a relatively small inward taper toward the bottom thereof to receive and firmly hold a correspondingly shaped spine of a driver bit against relative movement so that said bit may be used to control and guide the position of the screw, and a pair of driving slots extending outwardly and oppositely from said socket but terminating short of the periphery of said screw head, each of said slots having side walls and an outer end surface with said side walls slightly converging toward the bottoms thereof whereby primary engagement of said side walls adjacent said bottoms thereof with the relatively inclined driving wings of a driver bit effects the driving of said screw primarily adjacent the bottoms of said slots.

3. A screw having a head formed with a driving recess comprising a relatively small, driver holding socket having spaced opposing walls of substantially the shape of portions of a cone of relatively small apical angle, to receive and firmly hold a correspondingly shaped spine of a driver bit against relative movement so that said bit may be used to control and guide the position of the screw, and a pair of driving slots extending outwardly and oppositely from said socket intermediate said socket walls and each having side walls and an outer end surface with said side walls slightly converging toward the bottoms thereof whereby said side walls of said slots are brought into primary engagement adjacent the bottoms thereof with the relatively inclined driving wings of a driver bit, to effect the driving of said screw primarily adjacent the bottoms of said side walls of said slots.

4. A screw having a head formed with a driving recess comprising a relatively small driver holding socket having a relatively small inward taper toward the bottom thereof to receive and firmly hold a correspondingly shaped spine of a driver bit against relative movement so that said bit may be used to control and guide the position of the screw, and a pair of driving slots extending outwardly and oppositely from said socket but terminating short of the periphery of said screw head, each of said slots having side walls and an outer end surface with said end surface inclined first mainly outwardly and then mainly upwardly from adjacent the bottom of said socket toward the top of said recess to provide broad driving surfaces adjacent the bottoms of said slots, said side walls slightly converging toward the bottoms thereof whereby primary engagement of said side walls adjacent said bottoms thereof with the relatively inclined driving wings of a driver bit effects the driving of said screw primarily by said broad driving surfaces adjacent the bottoms of said slots.

5. A screw having a head formed with a driving recess comprising a relatively small, driver holding socket having spaced opposing walls of substantially the shape of portions of a cone of relatively small apical angle, to receive and firmly hold a correspondingly shaped spine of a driver bit against relative movement so that said bit may be used to control and guide the position of the screw, and a pair of driving slots extending outwardly and oppositely from said socket intermediate said socket walls but terminating short of the periphery of said screw head, each of said slots having side walls and an outer end surface with said end surface inclined first mainly outwardly and then mainly upwardly from adjacent the bottom of said socket toward the top of said recess to provide broad driving surfaces adjacent the bottoms of said slots, said side walls slightly converging toward the bottoms thereof whereby primary engagement of said side walls adjacent said bottoms thereof with the relatively inclined driving wings of a driver bit effects the driving of said screw primarily by said broad driving surfaces adjacent the bottoms of said slots.

6. A screw having a head formed with a driving recess comprising a relatively small driver holding socket having spaced opposing walls of substantially the shape of portions of a cone of relatively small apical angle, to receive and firmly hold a correspondingly shaped spine of a driver bit against relative movement so that said bit may be used to control and guide the position of the screw, and a pair of driving slots extending outwardly and oppositely from said socket and each having side walls and an outer end surface with said end surface inclined outwardly and upwardly from adjacent the bottom of said socket toward the top of said recess but at such depth as to clear the outer end surfaces of wings of corresponding shape on a bit seated in said socket with said wings in driving engagement with said side walls of said slots.

7. A screw having a head formed with a driving recess comprising a relatively small driver holding socket having spaced opposing walls of substantially the shape of portions of a cone of relatively small apical angle, to receive and firmly hold a correspondingly shaped spine of a driver bit against relative movement so that said bit may be used to control and guide the position of the screw, and a pair of driving slots extending outwardly and oppositely from said socket and each having side walls and an outer end surface with said end surface inclined outwardly and upwardly from adjacent the bottom of said socket toward the top of said recess and terminating short of the periphery of said screw head, said head having an upper face dished inwardly to receive the extended end of said driver bit and guide the same into said recess, and said socket being extended slightly below the bottoms of said slots to receive said extended end of said bit.

8. A screw having a head formed with a driving recess comprising a driver holding socket of slightly tapered, generally rounded form concentric with the screw axis, said socket extending adjacent the bottom of the screw head but having a diameter which is small in relation to the diameter of said head, so as to afford a longitudinally elongated shape capable of being wedgingly and firmly gripped by a correspondingly shaped portion of a driver bit for supporting and controlling the direction of the screw, said recess also comprising slots extending outwardly and upwardly from opposite sides of said socket toward the top of said screw head but having closed ends located inwardly of the periphery of said head for the reception of driving wings of generally corresponding shape on said driver bit.

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