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TOOL FOR SETTING HOLLOW RIVETS BY SPINNING ACTION

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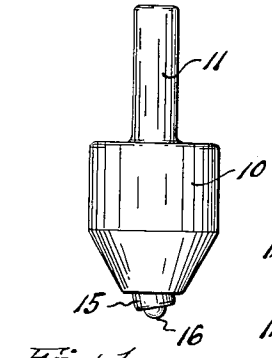



Fig. 1

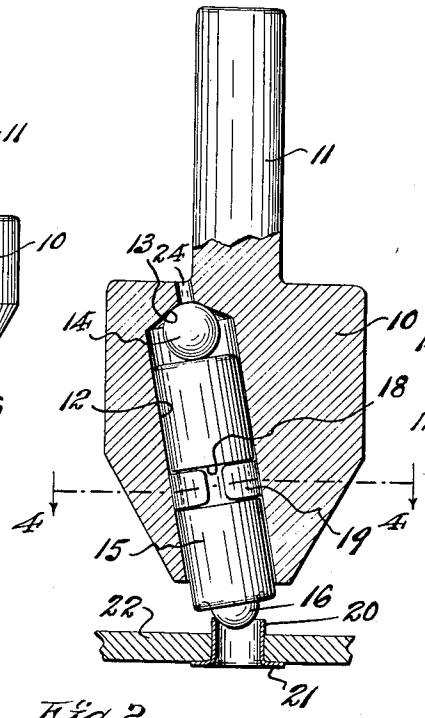



Fig. 2

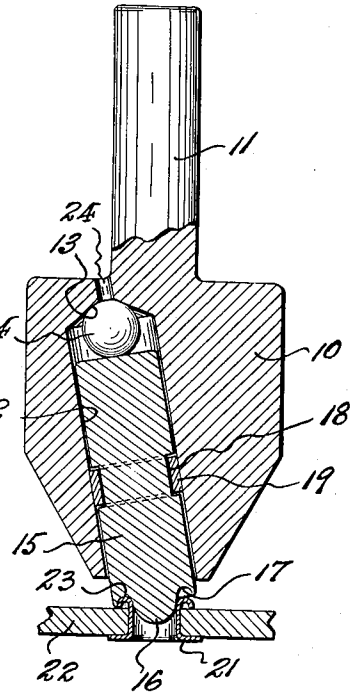



Fig. 3

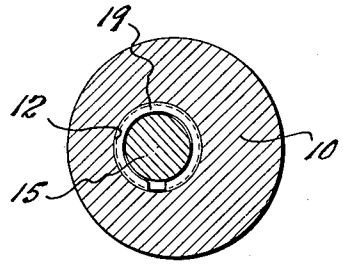



Fig. 4

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# TOOL FOR SETTING HOLLOW RIVETS BY SPINNING ACTION

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4 Claims. (Cl. 218—38)

This invention relates to an improved tool for setting hollow rivets, eyelets and the like.

Tools heretofore generally employed to upset, spread and clench over the tubular end of a hollow rivet, eyelet or the like, whereby to secure the same in attached relation to the work to which it is to be operatively applied, are ordinarily of the punch type, so operated as to transmit a directly downward, axial thrusting force against the tubular end of the hollow rivet or eyelet, whereby to turn and spread the latter, simultaneously in all radial directions, into a flattened down clenched relation to the work. Tools of such punch type so abruptly stress the metal of the hollow rivet or eyelet as to frequently split or fracture the same, or so abrade the surface and finish thereof as to detrimentally affect the appearance of the finished work.

Having the undesirable effects of hollow rivet or eyelet setting tools of the punch type in view, it is an object of this invention to provide a novel hollow rivet or eyelet setting tool which functions by a spinning action rather than by a direct downward axial thrusting force or blow.

The invention has for a further object to provide a novel construction of hollow rivet or eyelet setting tool which is adapted to be rotated while being downwardly moved in engagement with a hollow rivet or eyelet to be set; said tool having an independently rotative spinning element operation to engage the tubular end portion of the rivet or eyelet; the axis of said spinning element being disposed in angularly inclined relation to the axis of said tubular end portion of the rivet or eyelet, so as to roll around the periphery of the latter with spinning action, whereby to so gradually and progressively turn, spread and iron down the metal thereof to desired clenched over relation to the work, that risk of fracturing the metal, or detrimentally abrading the surface or finish thereof is avoided.

The above and other objects will be understood from a reading of the following detailed description of this invention in connection with the accompanying drawings of an embodiment thereof, in which drawings:

Fig. 1 is a side elevational view of the hollow rivet or eyelet setting tool of this invention.

Fig. 2 is a longitudinal sectional view, drawn on an enlarged scale, with the spinning element of the same shown in elevation, the tool being disposed in its initial application to a hollow rivet or eyelet operated upon.

Fig. 3 is a longitudinal sectional view similar to that of Fig. 2, but showing the spinning element also in section, and in its operative relation to a hollow rivet or eyelet operated upon.

Fig. 4 is a transverse horizontal section, taken on line 4—4 in Fig. 2.

Referring to the drawings, in which like reference characters indicate corresponding parts, the reference character 10 indicates the main body of the tool of this invention, the same having an upwardly projecting axial shank 11 by which it can be connected with the coupling chuck of suitable mechanism operative to actuate the tool.

The main body 10 of the tool is provided with a downwardly open angular bore 12, the longitudinal axis of



which intersects the longitudinal axis of said main body, at a point adjacent to the lower free end of said body, and at an angle of inclination thereto which preferably approximates ten degrees. The upper end of the bore 12 is formed to provide a conoidal bearing seat 13, upon which seats an axially disposed thrust bearing ball 14. Freely rotatable in the bore 12 of the main body 10 is a cylindrical spinning element 15 of substantial length, the upper or inner end of which impinges axially upon the thrust bearing ball 14. The lower or outer end of the spinning element 15 exteriorly projects somewhat from the lower free end of the main body 10, and is shaped to provide an axially extending center point 16, which is preferably semispherical in form, said center point being surrounded by an annular, transversely arched or concave, spinning die formation 17.

Means is provided for retaining the spinning element 15 in the bore 12 of the main body 10 against outward axial displacement therefrom, but in such manner as not to impede the free rotative movement of said spinning element relative to said main body. The means for this purpose preferably comprises provision in the spinning element 15 of an annular receiving groove or channel 18 intermediate its ends, in which groove or channel is engaged a discontinuous, resiliently expansible keeper spring ring 19, the tensional expansion of which causes the same to frictionally grip the wall surfaces of the bore 12 of the main body 10, whereby to support said spinning element 15 in operative assembled rotative relation thereto.

The main body 10 is desirably provided with an opening 24 leading into the upper end of the bore 12 thereof, and to the thrust bearing means therein, for admission of lubricant.

In the use and operation of the hollow rivet or eyelet setting tool of this invention, the shank 11 of the main body 10 of the tool is coupled to the coupling chuck of a suitable actuating mechanism operative to rotate the tool, while at the same time transmitting a downward axial thrusting force thereto. For example, the tool can be fixed in the chuck of the rotatable and axially movable spindle of a drill press. The main body 10 of the tool being operatively rotated by the actuating mechanism, the tool is moved down into operative engagement with the tubular end portion 20 of a hollow rivet or eyelet 21 to be set (see Fig. 2). Since, however, the transverse plane of the operative end of the spinning element 15 is angularly inclined to the transverse plane of the tubular end portion 20 of the hollow rivet or eyelet 21, when the center point 16 of the spinning element 15 enters said tubular end portion 20, a point in the circuit of the spinning die formation 17 engages a point of the peripheral margin or edge of said tubular end portion 20.

Under these conditions, as the tool is rotated, with accompanying down thrusting force, the spinning element being free to rotate in and independently of the main body 10, the spinning die formation 17 will roll on and around the peripheral margin or edge of the tubular end portion 20 of the hollow rivet or eyelet 21, with the result that said margin or edge will be spun outwardly and downwardly by a rolling and ironing down action which progresses around the peripheral margin or edge of said tubular end portion, and continues until the latter is turned, spread and clenched over upon and against the work 22 to which the hollow rivet or eyelet is applied, in a set formation 23 thereof (see Fig. 3). Owing to such spinning or rolling and ironing working of the metal of the tubular end portion 20 of the hollow rivet or eyelet, said metal is worked gradually to the desired set condition, without risk of fracture, and without abrading the metallic surface, or plated finish thereof, if the latter is present. Due to the inclination of the spinning element 15 relative to the longitudinal axis of the main body 10 of the tool, rotative

movement of said spinning element is imparted thereto by reason of its traction with and upon the tubular end portion of the hollow rivet or eyelet which is undergoing the setting operation, and such rotative movement will be at a considerably slower speed than the rotative speed of the driven tool body **10**, said rotative speed of the spinning element being approximately thirty per cent slower than the rotative speed of said tool body.

Having now described my invention, I claim:

1. A tool for the purposes described comprising a main body having a chuck engageable axial shank projecting from its top end and by which it can be rotated about its vertical axis, said body having an angularly inclined downwardly open cylindrical bore convergent upon its vertical axis at the bottom end thereof, said bore terminating at its upper end in a conoidal bearing seat, a cylindrical spinning element rotatably mounted in said bore, the operative lower end of said spinning element projecting exteriorly from the bottom end of said man body and being formed to provide an axially projecting center point portion surrounded by an annular spinning die formation, and a single thrust bearing ball supported by said conoidal bearing seat upon which the upper end of said spinning element impinges.



2. A tool for the purposes described according to claim 1 wherein said main body is provided with a lubricant admission opening in its top end to communicate with said conoidal bearing seat and the thrust bearing ball supported thereby.

3. A tool for the purposes described according to claim 1 wherein said spinning element is provided with an annular channel intermediate its ends, and a discontinuous expandible spring keeper ring engaged in said channel and adapted to frictionally grip the wall surface of said body bore, whereby to retain the spinning element against outward displacement from said body bore.

4. A tool for the purposes described according to claim 3 wherein said main body is provided with a lubricant admission opening in its top end to communicate with said conoidal bearing seat and the thrust bearing ball supported thereby.

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