April 13, 1965 S. S. KAHN 3,177,755

WALLBOARD SCREWS

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FIG. 2

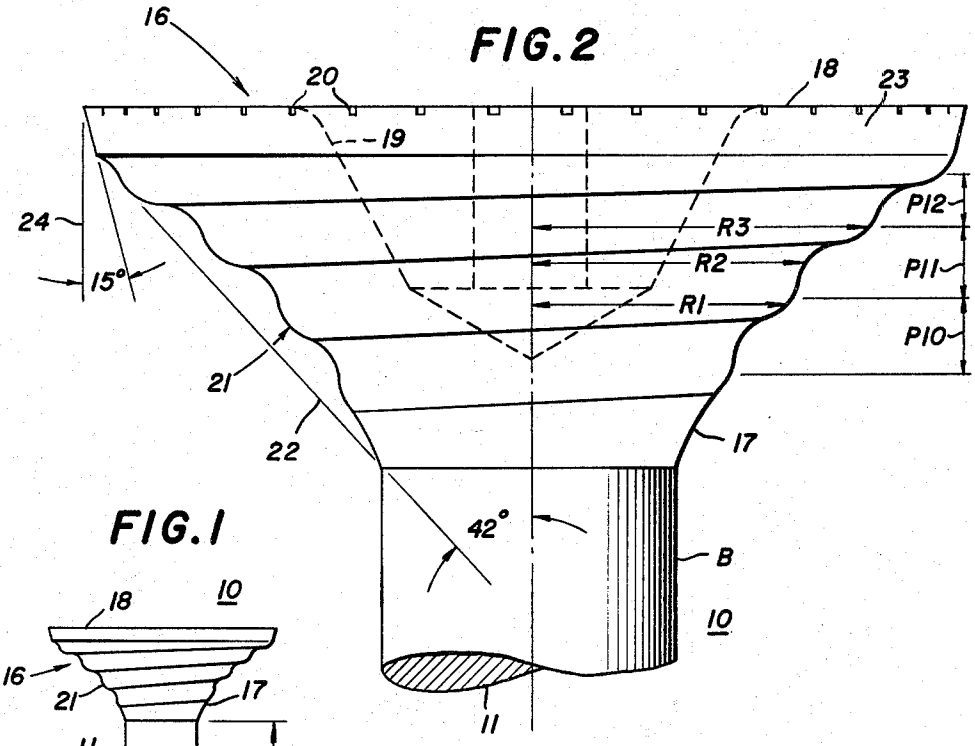

FIG. 1

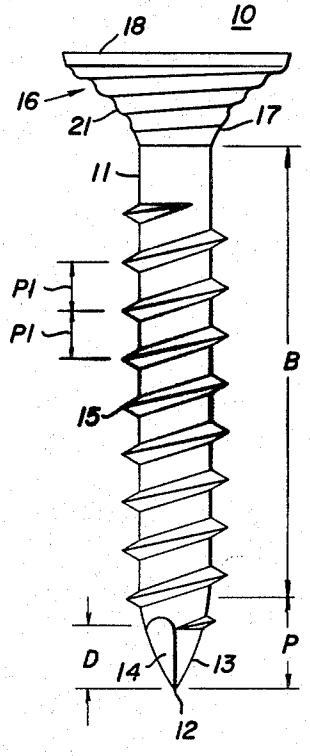

FIG. 3

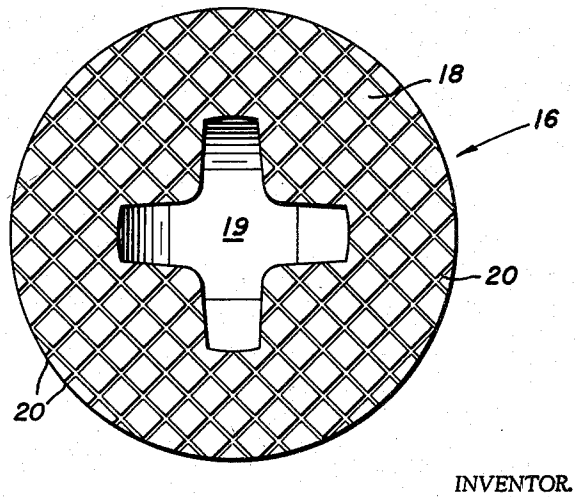

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FIG. 4

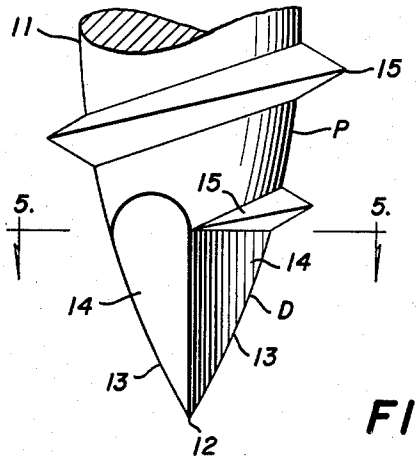


FIG. 5

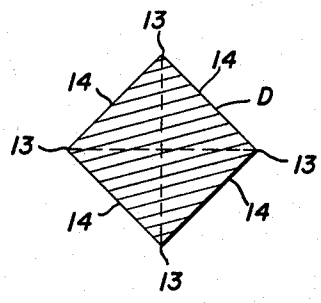
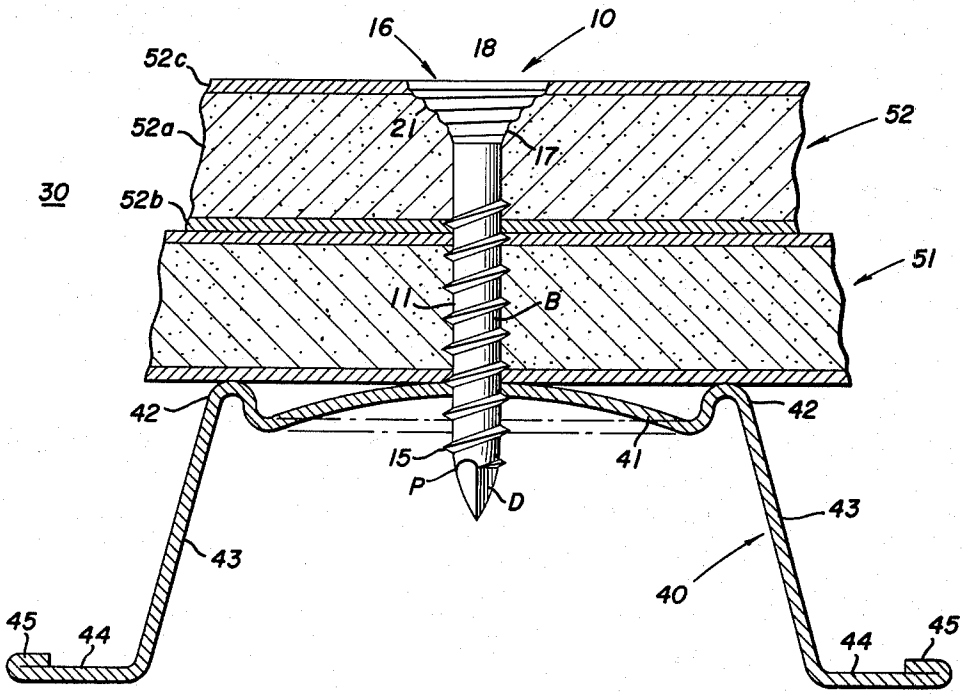


FIG. 6



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WALLBOARD SCREWS

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5 Claims. (Cl. 85—41)

The present invention relates to wallboard screws.

It is a general object of the invention to provide an improved wallboard screw that is especially adapted to fasten a wallboard upon an underlying support.

Another object of the invention is to provide an improved wallboard screw comprising an elongated shank, drill structure carried by the pilot end of the shank, a self-tapping thread carried by the body of the shank, and an enlarged head of the countersink type carried by the rear end of the shank.

A further object of the invention is to provide in a wallboard screw, an improved head of the countersink type comprising a substantially flat tool-engaging face in which there is formed both a tool-receiving recess and a plurality of serrations surrounding the tool-receiving recess, wherein the tool-receiving recess and the serrations cooperate to anchor in place a thin coating of plaster, or the like, that may be applied to the tool-engaging face after the head has been set in countersunk relation with the cooperating wallboard.

A further object of the invention is to provide in a wallboard screw, an improved head of the countersink type comprising a rearwardly tapered substantially conical thrust surface, and a corrugated structure carried by the thrust surface, whereby the corrugated structure is adapted to compress a complementary corrugated formation into the wall of a countersink recess provided in a cooperating wallboard, thereby materially to increase the effective frictional area of the thrust surface of the head in bearing engagement with the wallboard.

A further object of the invention is to provide a wallboard screw having a countersink head of the type described, wherein the corrugated structure mentioned is in the form of a thread-like structure carried by the thrust surface of the head, whereby the thread-like structure is adapted to compress a complementary thread-like formation into the wall of the countersink recess provided in the wallboard.

Further features of the invention pertain to the particular arrangement of the elements of the wallboard screw, whereby the above-outlined and additional operating features thereof are attained.

The invention, both as to its organization and method of operation, together with further objects and advantages thereof, will best be understood by reference to the following specification, taken in connection with the accompanying drawings, in which:

FIGURE 1 is a side elevational view of a wallboard screw embodying the present invention;

FIG. 2 is a greatly enlarged fragmentary side view of the head of the wallboard screw, illustrating the thread-like structure that is carried by the thrust surface thereof;

FIG. 3 is an enlarged plan view of the tool-engaging face of the wallboard screw, illustrating the tool-receiving recess and the grid-like patterns of serrations formed therein;

FIG. 4 is an enlarged fragmentary side view of the pilot end section of the shank of the wallboard screw, illustrating the drill structure that is carried upon the front end thereof;

FIG. 5 is an enlarged lateral sectional view of the drill structure mentioned, this view being taken in the direction of the arrows along the line 5—5 in FIG. 4; and

FIG. 6 is a reduced sectional view, taken through a

wall assembly and including a metal supporting stud, two layers of wallboard of the gypsum type, and the wallboard screw fastening together the elements named of the assembly.

Referring now to FIG. 1 of the drawings, the wallboard screw 10 there illustrated, and embodying the features of the present invention, essentially comprises a longitudinally extending shank 11 including a substantially cylindrical body section B merging into a forwardly tapered substantially conical pilot end section P terminating in a forwardly disposed point 12. The front portion of the pilot end section P carries drill structure D extending forwardly to the point 12; which drill structure D constitutes an essential star-drill including a plurality of angularly spaced-apart chisels 13 carried by the front portion of the pilot end section P and extending forwardly to the point 12. More particularly, as illustrated in FIGS. 4 and 5, the chisels 13 are defined by a corresponding plurality of substantially triangular-shaped flat faces 14 disposed in angularly spaced-apart relation and carried by the front portion of the pilot end section P and extending forwardly to the point 12, the chisels 13 and the faces 14 being alternately arranged about the front portion of the pilot end section P. In the arrangement illustrated, four of the chisels 13 and four of the faces 14 are provided in the star-drill D; however, any suitable number of such chisels 13 and intervening faces 14 may be provided in the star-drill D. Thus, it will be understood that the wallboard screw 10 is adapted to drill its own pilot hole in associated structure by virtue of the provision of the star-drill D at the front portion of the pilot end section P of the shank 11, as explained more fully subsequently.

A continuous self-tapping thread 15 is carried by the rear portion of the pilot end section P and by the front portion of the body section B; which thread 15 may have a substantially uniform pitch P1, as indicated in FIG. 1. In the construction, the lead end of the thread 15 disposed on the rear end of the pilot end section P terminates at the rear end of the star-drill D, as best shown in FIG. 4; whereby the lead end of the thread 15 enters the pilot hole that is drilled in the associated structure by the star-drill D and threads the same and draws the body of the thread 15 on the front portion of the body section B into threaded relation with the thus threaded hole in the associated structure.

Further, the wallboard screw 10 comprises, as shown in FIGS. 1 to 3, inclusive, an enlarged head 16 terminating the rear end of the body section B; which head 16 is of the countersink type including a rearwardly tapered substantially conical thrust surface 17 and a substantially flat tool-engaging face 18, the tool engaging face 18 being disposed substantially normal to the axis of the shank 11 and having a substantially centrally located tool-receiving recess 19 therein. Ordinarily, the rear end of the thread 15 terminates on the body section B somewhat forwardly of the head 16; however, if desired, the rear end of the thread 15 may extend rearwardly upon the body section B to a position disposed adjacent to the front end of the thrust surface 17. The tool-engaging recess 19 provided in the tool-engaging face 18 may be of any suitable type, but preferably, the same is of the Phillips type, as indicated in FIGS. 2 and 3. The tool-engaging face 18 of the head 16 carries a plurality of serrations 20 disposed in surrounding relation with the tool-receiving recess 19; which serrations 20 are preferably arranged in a substantially grid-like pattern, as illustrated in FIG. 3. When the wallboard screw 10 has been set with respect to an associated wallboard, the head 16 is disposed in countersunk relation therewith; whereby the thrust surface 17 engages the throat of the thus formed hole in the wallboard, and the tool-engaging face 18 is positioned sub-

stantially flush with the outer surface of the wallboard. At this time, the tool-receiving recess 19 and the serrations 20 are adapted to cooperate to receive and to anchor in place a thin coating of plaster, or the like, that may be subsequently applied to the tool-engaging face 18, when the head 16 is in countersunk relation with the wallboard, thereby to conceal the head 16 and to lend a smooth finished appearance to the outer surface of the wallboard.

Referring now more particularly to FIG. 2, the thrust surface 17 comprises a corrugated surface that is formed by a thread-like structure 21 carried thereby; which thread-like structure 21 comprises a plurality of turns disposed upon the thrust surface 17 and of the same hand as the thread 15. Thus, the thread-like structure 21 compresses a complementary thread-like formation into the throat of the previously mentioned hole in the wallboard, as the wallboard screw 10 is set therein with the head 16 in countersunk relation therewith, as explained more fully hereinafter. More particularly, the thrust surface 17 and the thread-like structure 21 carried thereby are located radially inwardly with respect to a simple frustum projected rearwardly from the front end to the rear end of the thrust surface 17, as indicated by the line 22 in FIG. 2, the line 22 of projection of the simple cone frustum mentioned being disposed at an angle of approximately 42° to the longitudinal center line of the wallboard screw 10. Also, in the construction of the head 16, a rearwardly tapered substantially frustoconical rim 23 is provided at the rear end of the thrust surface 17 and extending to the tool-engaging face 18; the wall surface of the rim 23 being disposed at a small angle of approximately 15° to a plane 24 positioned parallel to the longitudinal axis of the screw 10, as illustrated in FIG. 2. Accordingly, in the head 16, the thread-like structure 21 comprises a plurality of turns provided on the thrust surface 17 and extending rearwardly therealong to the conical rim 23; which turns of the thread-like structure 21 are of the same hand as the thread 15, as previously noted. Specifically, as illustrated in FIGS. 1 and 2, the turns of the thread 15 upon the body section B and the turns of the thread-like structure 21 on the thrust surface 17 are disposed in right-hand relation, so that when the wallboard screw 10 is turned toward the right, as viewed from the tool-engaging face 18, it is set in the associated structure.

Further considering the thread-like structure 21, the same has a variable pitch along the longitudinal axis of the head 16; which variable pitch of the thread-like structure 21 decreases from turn-to-turn from the front end toward the rear end of the thrust surface 17, as indicated at P10, P11, P12 in FIG. 2. Moreover, the constant pitch P1 of the thread 15 provided on the body section B of the shank 11 is materially greater than the variable pitch of the thread-like structure 21 provided on the thrust surface 17 of the head 16, as will be apparent from a comparison of the constant pitch P1 of the thread 15 and the variable pitch P10, P11 and P12 of the thread-like structure 21, as respectively shown in FIGS. 1 and 2, when it is appreciated that the scale of FIG. 2 is substantially greater than that of FIG. 1. Moreover, the thread-like structure 21 has a construction so that any two adjacent turns thereof respectively disposed in relatively front and rear positions on the thrust surface 17 have the respective crest radii R1 and R3 with a root therebetween having the root radius R2, all measured from the central longitudinal axis of the head 16, wherein $R1<R2<R3$, so as to avoid undercut in the thread-like structure 21 along the central longitudinal axis of the head 16, as is shown in FIG. 2. Accordingly, the thread-like structure 21 presents a generally sinuous profile along the thrust surface 17 and along the line of intersection of any radial plane passing through the longitudinal central axis of the head 16.

Considering now one satisfactory method of making the wallboard screw 10, a suitable section or length of steel wire of substantially cylindrical configuration is severed from a stock roll. One end of the section or blank is first upset to provide an enlargement thereupon that is ultimately fashioned to produce the head 16 of the finished wallboard screw 10. The enlargement mentioned provided on the one end of the blank is then subjected to pressure between a pair of cooperating front and rear die blocks. In this step, the rear die block forms the tool-engaging face 18 of the head 16, as well as the centrally disposed tool-receiving recess 19 therein and the serrations 20 therein, while the front die block forms the thrust surface 17 of the head 16, the thread-like structure 21 carried thereby, and the rim 23. In other words, in the last mentioned step, the finished head 16 is produced from the enlargement provided on the one end of the blank, so that simultaneously the elements 18, 19, 20, 17, 21 and 23 of the head 16 are fashioned. After the finished head 16 is thus formed on the one end of the blank, the other end of the blank is subjected to pressure in a suitable die set to produce the faces 14, the chisels 13 and the point 12 comprising the elements of the drill structure D. Thereafter, the body of the cylindrical blank disposed between the finished head 16 and the fundamental elements of the drill structure D is subjected to a thread-rolling operation in a suitable pair of thread-rolling dies, whereby simultaneously the thread 15 is provided upon the front end of the body section B and the rear end of the pilot section P of the shank 11; which formation of the lead end of the thread 15 produces the finished configuration of the drill structure D provided on the front portion of the pilot end section P of the shank 11. After the wallboard screw 11 is thus fashioned, it is normally subjected to suitable heat-treatment, so as appropriately to harden the drill structure D, as well as the thread 15 carried by the shank 11.

Turning now to FIG. 6, there is illustrated a wall assembly 30 comprising a metal stud 40, two identical panels 50 and 51 of wallboard and the wallboard screw 10 of the construction previously described. More particularly, the stud 40 may be formed of a suitable sheet metal of relatively thin gauge, such, for example, as a sheet of aluminum alloy. The stud 40 is of elongated form and has a lateral cross-section, as shown in FIG. 6, comprising a centrally disposed web 41 terminating at the opposite sides thereof in two rearwardly projecting and laterally spaced-apart ribs 42 respectively terminating in two forwardly and laterally outwardly projecting wings 43 respectively terminating in two laterally and outwardly projecting flanges 44 respectively provided forwardly folded edge portions 45. Accordingly, the stud 40 is of relatively strong lightweight construction and the inner wallboard panel 51 is disposed in supported relation upon the two laterally spaced-apart ribs 42 and rearwardly of the central web 41; the outer panel 52 is disposed in supporting relation upon the inner panel 51; and the assembly is fastened together by the wallboard screw 10, as previously noted. The two wallboard panels 51 and 52 may be identical, each being of the gypsum type; and more particularly, the outer wallboard panel 52 is of conventional construction comprising a central body 52*a* formed essentially of calcium sulfate or gypsum, an inner facing layer 52*b* formed of kraft paper and an outer facing layer 52*c* formed of kraft paper. Each of the wallboard panels 51 and 52 is of strong self-supporting structure, so as to facilitate ready handling and assembly thereof, all in a conventional manner.

In the assembly 30, the illustration of the two wallboard panels 51 and 52 in stacked relation with each other and in supported relation with the stud 40 is made entirely for the purpose of the present description, since the assembly 30 may comprise only the single outer wallboard panel 52. Also, it will be understood that in the building construction in which the wall assembly 30 is incorporated, the stud 40 is securely anchored in place to a rigid external support, not shown.

Turning now to the production of the assembly 30,

as shown in FIG. 6, the stud **40** is securely anchored to an external support, not shown; the two wallboard panels **51** and **52** are positioned in stacked relation with each other and in supported relation upon the two ribs **42** of the stud **40**; and a series of wallboard screws **10** are driven in longitudinally spaced-apart relation through the two wallboard panels **52** and **51** and into the web **41** of the stud **40**, so as to secure together the elements of the assembly **30**. More particularly, in the driving of each of the wallboard screws **10**, the point **12** thereof is first placed in contact with the outer surface of the outer wallboard panel **52** at the required location and positioned rearwardly of the web **41** of the stud **40**, and without the benefit of a pilot hole in the outer wallboard panel **52**. The wallboard screw **10** is then pressed forwardly and rotated so that the drill structure D carried on the extreme front end of the pilot end section P thereof successively drills its own aligned pilot holes in the outer wallboard panel **52**, in the inner wallboard panel **51** and in the web **41** of the stud **40**. As each of the structural members **52**, **51** and **41** is successively penetrated by the drill structure D, the lead end of the thread **15** on the rear portion of the pilot end section P of the shank **11** successively enters the thus drilled pilot holes and successively threads the same and successively draws the body of the thread **15** on the front portion of the body section B of the shank **11** into threaded relation with the thus threaded holes in the structural members mentioned. In the continued driving of the wallboard screw **10**, the thread **15** disposed in threaded engagement with the thus threaded hole provided in the web **41** draws the web **41** outwardly toward the adjacent surface of the inner wallboard panel **51**, so that the same may be flexured into engagement therewith at a position disposed intermediate the two ribs **42**, as illustrated in FIG. 6. In the final driving of the wallboard screw **10**, the head **16** is moved into countersunk relation with respect to the outer wallboard panel **52**; and more particularly, at this time, the thrust surface **17** of the head **16** engages the throat of the thus formed hole in the outer wallboard panel **52** and the tool-engaging face **18** of the head **16** is disposed substantially flush with the outer surface of the outer wallboard **52**. As the head **16** of the wallboard screw **10** is driven into its set postion with respect to the outer wallboard panel **52**, the thread-like structure **21** provided on the thrust surface **17** compresses a complementary thread-like formation in the throat of the thus formed hole in the outer wallboard panel **52**, whereby the wallboard screw **10** exerts great clamping pressure between the head **16** thereof and the web **41** of the stud **40**, with the result that the wallboard panels **52** and **51** are securely clamped together in stacked relation with each other, and the front surface of the inner wallboard panel **51** is firmly clamped in position upon the two ribs **42** and also perhaps upon the central portion of the web **41** depending upon the rearward flexure thereof, as previously mentioned. The arrangement of the thread-like structure **21** upon the thrust surface **17** of the head **16** materially increases the effective frictional area of the thrust surface **17**, so as to accommodate a substantial increase in the clamping pressure that is exerted upon the wallboard panels **51** and **52** without causing forward buckling of the body **52***a* of gypsum incorporated in the outer wallboard panel **52**, with the result thae the outer surface of the outer wallboard panel **52** is entirely smooth and flat adjacent to the tool-engaging face **18** of the head **16** in its countersunk position with respect to the outer wallboard panel **52**. Accordingly, the assembly is of smooth and finished appearance, whereby the thin coating of plaster, or the like, not shown, may then be applied to the tool-engaging face **18** of the head **16**, so as to provide an entirely finished appearance to the outer surface of the outer wallboard panel **52**. The thin coating of plaster mentioned is securely anchored in place by the cooperation between the tool-receiving recess **19** and the grid-like serrations **20** provided in the tool-engaging face **18** of the head **16**; whereby the head **16** is completely concealed with respect to the exterior surface of the outer wallboard panel **52**.

In view of the foregoing, it is apparent that there has been provided a wallboard screw of improved and simplified construction and arrangement.

While there has been described what is at present considered to be the preferred embodiment of the invention, it will be understood that various modifications may be made therein, and it is intended to cover in the appended claims all such modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. A wallboard screw comprising a longitudinally extending shank including a substantially cylindrical body section merging into a forwardly tapered substantially conical pilot end section terminating in a forwardly disposed point, drill structure carried by the front portion of said pilot end section and extending to said point, a self-tapping thread carried by the rear portion of said pilot end section and by the front portion of said body section, an enlarged head terminating the rear end of said body section, said head being of the countersink type including a rearwardly tapered substantially conical thrust surface and a substantially flat tool-engaging face, said tool-engaging face being disposed substantially normal to the axis of said shank and having a tool-receiving recess therein, whereby said screw may be set in a cooperating wallboard with said head in countersunk relation therewith and with said thrust surface in engagement with the throat of the hole in the wallboard through which said shank extends and said tool-engaging face positioned substantially flush with the outer surface of the wallboard, and a thread-like structure carried by said thrust surface, said thread having a first substantially constant pitch along the axis of said shank, said thread-like structure having a second variable pitch along the axis of said head, said first pitch being materially greater than said second pitch, said thrust surface and said thread-like structure being located radially inwardly with respect to a simple cone frustum projected rearwardly from the front end to the rear end of said thrust surface, whereby said thrust surface and said thread-like structure have a concave configuration and a resulting composite frictional area that is materially greater than that of the simple cone frustum mentioned, and whereby said thread-like structure compresses a complementary thread-like formation into the throat of the previously mentioned hole in the wallboard as said screw is set therein with said head in countersunk relation therewith.

2. The wallboard screw set forth in claim 1, wherein said second pitch decreases from turn to turn of said thread-like structure rearwardly along the axis of said head from the front end toward the rear end of said thrust surface.

3. The wallboard screw set forth in claim 1, wherein said thread-like structure has a construction so that any two adjacent turns thereof respectively disposed in relative front and rear positions thereon have the respective crest radii R1 and R3 with a root therebetween having the root radius R2, all measured from the central axis of said head,

$$\text{wherein } R1<R2<R3$$

so as to avoid undercut in said thread-like structure along the central axis of said head.

4. The screw fastener set forth in claim 1, wherein said tool-engaging face also has a plurality of serrations therein and disposed in surrounding relation with said tool-receiving recess, whereby said tool-receiving recess and said serrations are adapted to anchor in place a thin coating of plaster, or the like, that may be applied to said tool-engaging face after said screw has been set in the wallboard with said head in countersunk relation therewith.

5. The wallboard screw set forth in claim 4, wherein said serrations are arranged in a grid-like pattern in said tool-engaging face.

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