

[54] SCREW MAGAZINE MECHANISM FOR
POWER SCREWDRIVER

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221/232; 221/251; 221/279

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173/107; 226/77, 157; 221/232, 251, 279;
144/32

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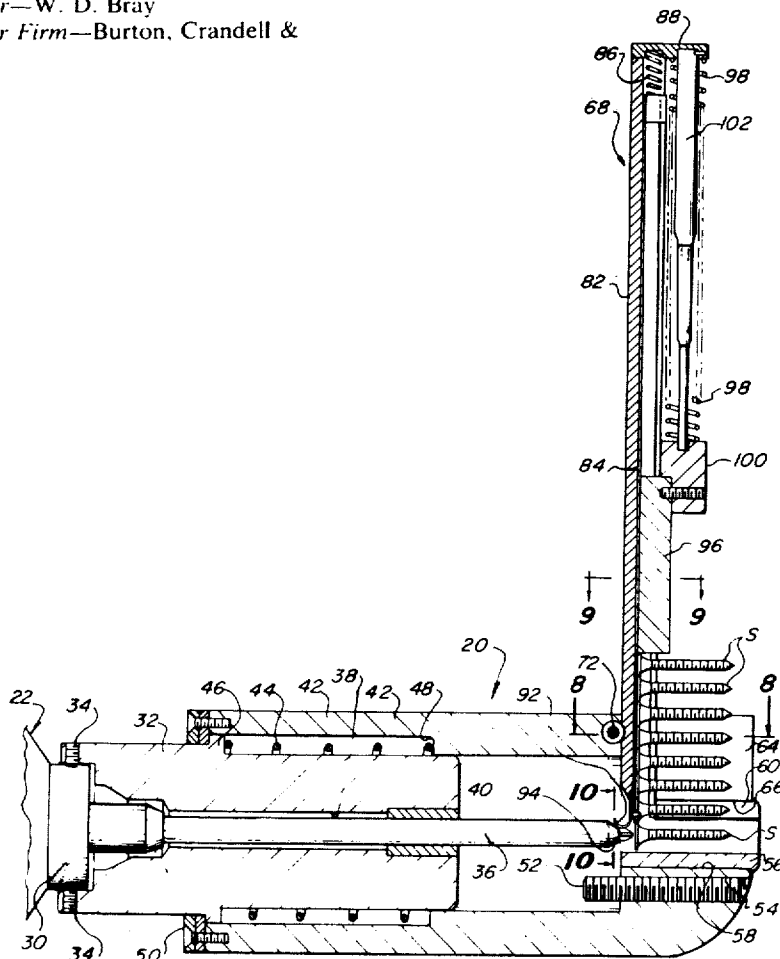
Assistant Examiner—W. D. Bray

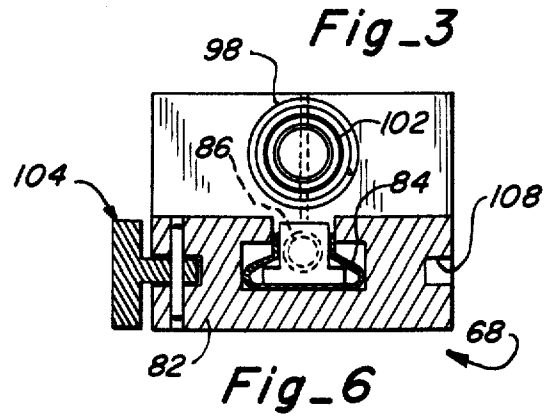
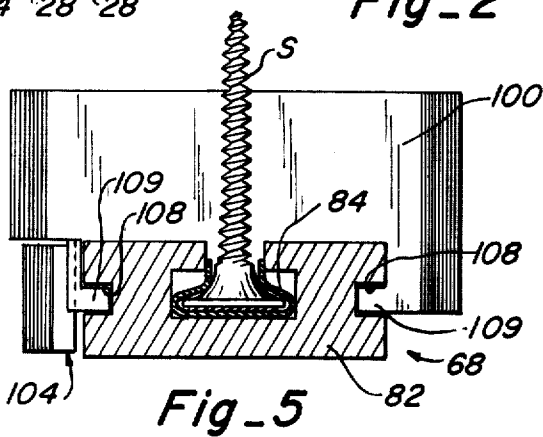
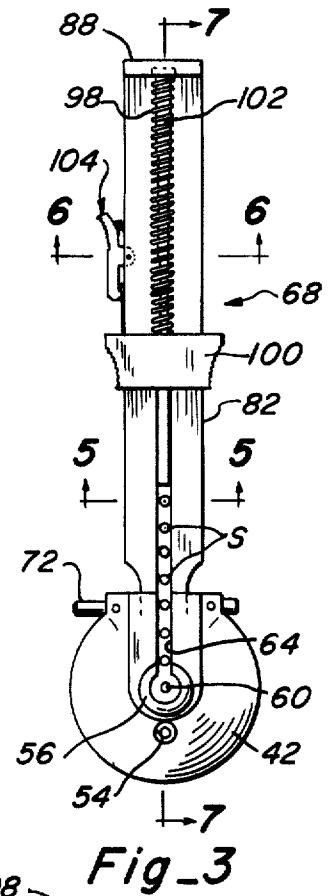
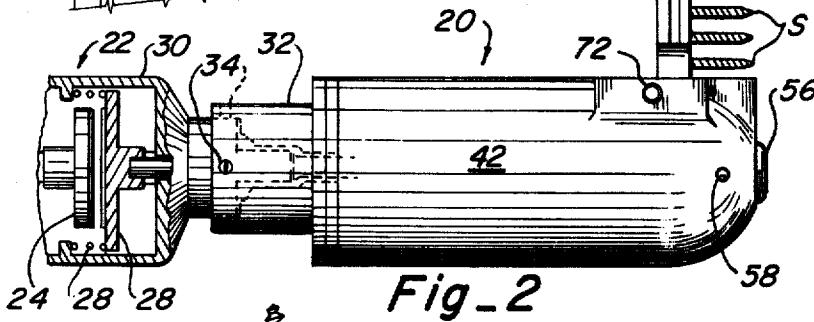
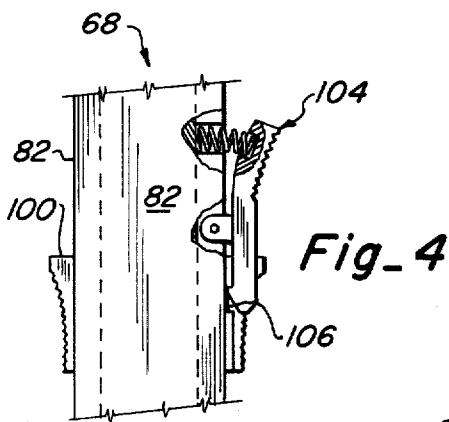
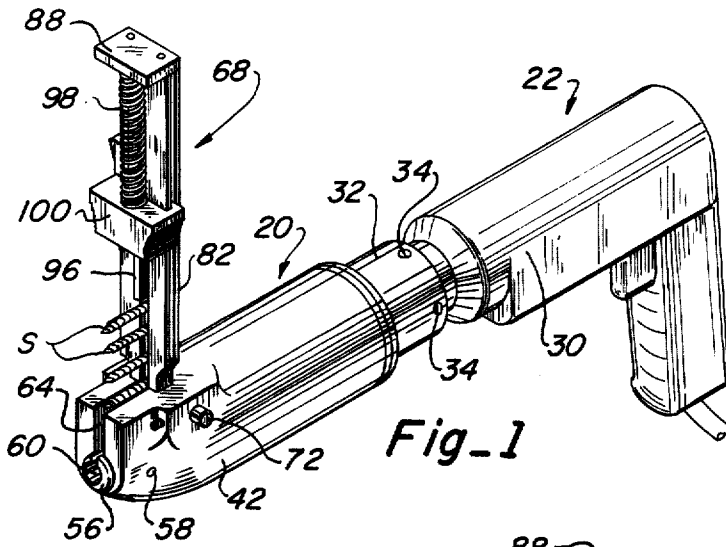
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[57] **ABSTRACT**

A screw magazine mechanism for automatically feeding screws into operative, driving alignment with the bit of a power-driven screwdriver. An adapter fixedly mounted on the power screwdriver case supports a housing for reciprocatory movement axially of a screwdriver bit which is rotatably positioned within the housing. The housing is spring biased to a normally assumed forward end limit of movement where a magazine clip carrying an array of screws, detachably carried by the housing, is aligned to position the endmost screw in the clip in coaxial forwardly spaced alignment with the bit. The screws are carried within the clip by an insert member which is reciprocable radially of the bit axis and is normally spring biased to project radially into a screw guide passage in a nose piece at the forward end of the housing. Upon rearward movement of the housing relative to the case mounted adapter, the bit advances into engagement with the endmost screw as cooperating cam means on the bit and insert member shift the insert member clear of the passage to release the endmost screw from the magazine as it is engaged by the bit.

26 Claims, 18 Drawing Figures





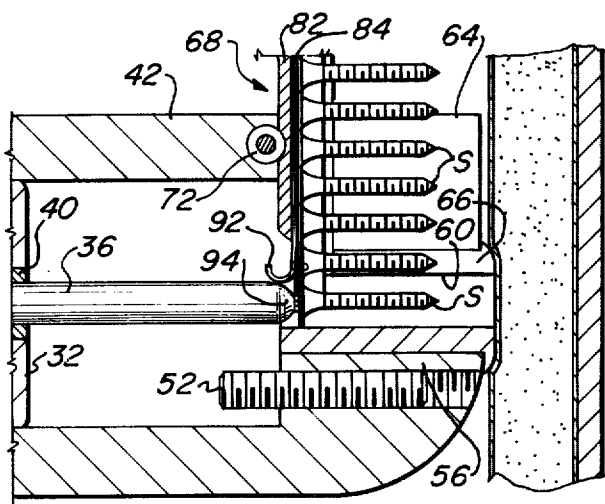


Fig. 12

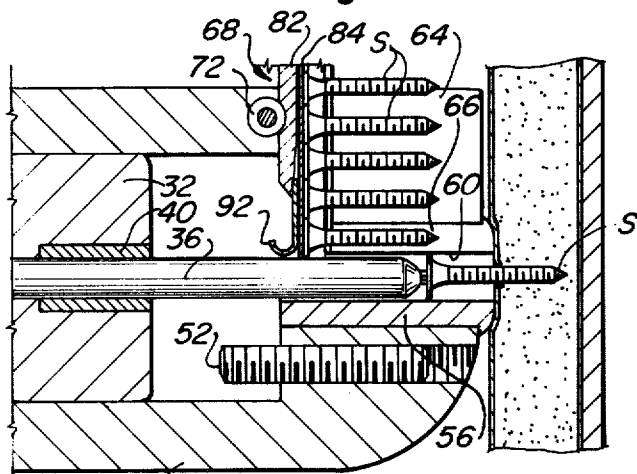


Fig. 13

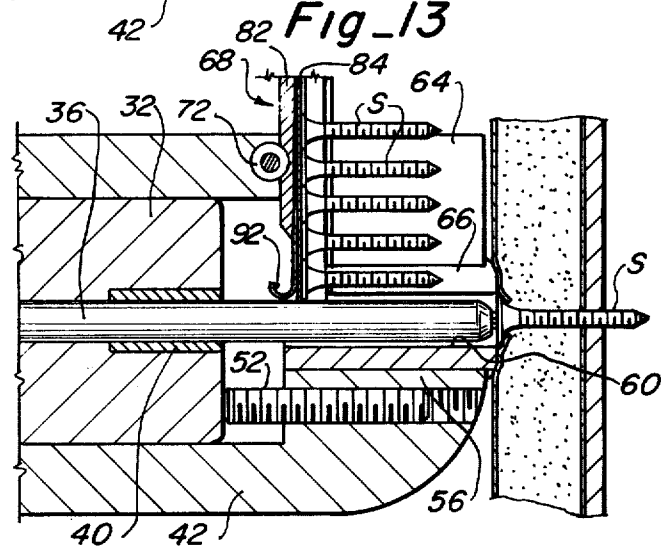


Fig. 14

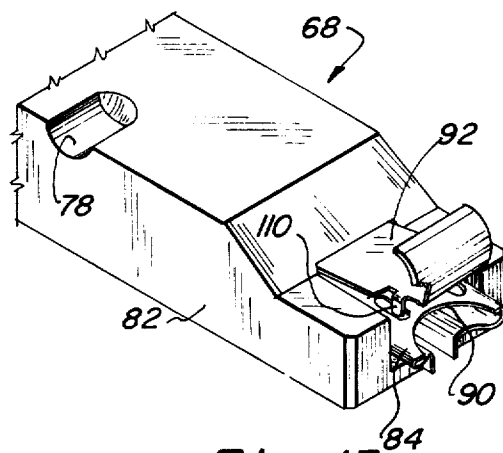


Fig. 15

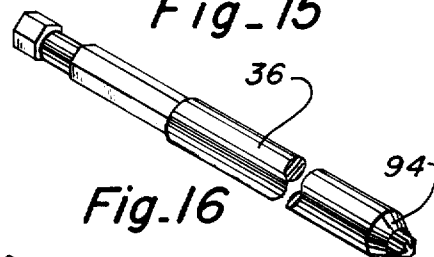


Fig. 16

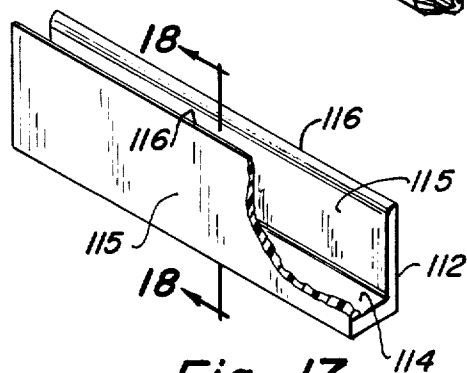


Fig. 17

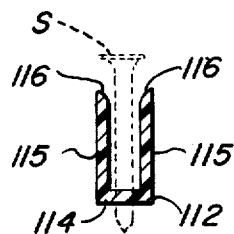


Fig. 18

SCREW MAGAZINE MECHANISM FOR POWER SCREWDRIVER

FIELD OF THE INVENTION

The present invention relates to a screw magazine mechanism for use with a power screwdriver with the magazine being of relatively light weight, compact construction and operable to feed screws automatically into operative alignment with the bit regardless of the position of the tool.

Although the screw magazine mechanism of the present invention is of general utility, it finds particular but not necessarily exclusive utility in the installation of sheetrock or drywall, particularly where the drywall is installed on sheet metal studs. This type of construction is now widely employed in the construction of residential, commercial and office buildings where non-load supporting interior walls often must be rearranged to suit the preference of the tenants. Where sheet metal studs are employed, the drywall is most conveniently secured to the studs by self-tapping sheet metal screws which are installed by a power driven screwdriver.

BACKGROUND OF THE INVENTION

While screw magazine assemblies for use with power driven screwdrivers are commercially available, certain shortcomings in presently known or available magazine structures are such that most drywall installers prefer to hold the screw in one hand at the desired position and to then engage the bit with the screw, releasing the screw as it becomes engaged in the wall. This practice has obvious drawbacks from the standpoint of safety, but is widely employed primarily because most presently available magazines are extremely cumbersome and awkward to use, particularly where screws must be placed in locations with limited clearance. It is also a widespread practice to utilize magnetized screwdriver bits. The screw is positioned on the bit and held there by magnetic attraction. The operator can then drive the screw using one hand, while holding the drywall sheet with the other.

Many known magazine structures employ hoppers or loading chutes which involve a gravity feed requiring the tool to be held upright during operation, thus limiting use of those tools to the installation of screws in vertical surfaces where there is a substantial vertical clearance above the location at which the screw is to be placed.

A variety of screw feeding mechanisms for power screwdrivers and the like are known in the art. See for example, U.S. Pat. No. 2,943,652 issued July 5, 1960, to W. O. Chilton for "POWER OPERATED TOOL FOR FEEDING AND DRIVING HEADED FASTENERS"; U.S. Pat. No. 3,526,257, issued Sept. 1, 1970 to J. T. Kirkland for "MECHANISM FOR FEEDING AND DRIVING SCREWS"; U.S. Pat. No. 3,554,246 issued Jan. 12, 1971 to D. B. Halstead for "TOOL FOR DRIVING FASTENERS"; U.S. Pat. No. 3,587,683 issued June 28, 1971 to K. R. Bangarter and J. P. Law for "AUTOMATIC SCREWDRIVER" and U.S. Pat. No. 3,601,168 issued Aug. 24, 1971, to G. H. Fernstrom for "DRIVING TOOL FOR FASTENERS."

OBJECTS OF THE INVENTION

It is the principal object of the present invention to provide a new and improved screw magazine mechanism for use with power screwdrivers.

Another object of this invention is to provide a new and improved screw magazine mechanism which, when mounted on a power screwdriver, feeds screws into driving position rapidly and accurately, in all positions, orientations and locations of the power screwdriver.

A further object of the invention is to provide a screw magazine mechanism of the above character which is simple in construction, trouble-free and rugged in use, and is adaptable for use with most if not all commercially available power screwdrivers.

Still another object of the invention is to provide a screw magazine mechanism of the foregoing type which is readily and easily loaded with a set of screws, accurately positions and feeds the screws into driving position, is sure and nonjamming in operation, and substantially increases the speed and facility of dry wall and sheetrock installation.

Other objects and advantages of the present invention will become apparent from the following description and accompanying drawings illustrating a preferred embodiment of the present invention.

SUMMARY OF THE INVENTION

The screw magazine mechanism of the present invention embodies an adapter unit which is fixedly mounted upon the forward end of a power screwdriver case in coaxial surrounding relationship to the chuck and bit of the screwdriver. The construction of the portion of adapter unit which engages the screwdriver case will vary in accordance with the specific make and model of screwdriver upon which the magazine mechanism is to be employed. The adapter unit in turn supports a housing having a bit receiving passage for reciprocatory movement upon the screwdriver case axially of the bit, a spring being engaged between the adapter and housing to resiliently bias the housing to a forward end limit of movement relative to the bit. A nose piece at the forward end of the housing is formed with a screw guide passage coaxially aligned with the bit, the tip or driving end of the bit being located near the rear or inner end of the nose piece passage when the housing is at the aforementioned forward limit of movement. A screw magazine clip is detachably mounted in the housing to extend radially from the nose piece passage and retains an aligned row of screws with the screw axes extending parallel to the bit axis and with the screws all lying in a common plane radial to the screwdriver bit axis. A spring in the magazine resiliently biases the array of screws towards the nose passage so that the endmost screw in the magazine is located in a ready position coaxially within the passage and with the screw head located just forwardly of the driving tip of the bit. The heads of the screws in the magazine are slidably retained within an insert member which is in turn reciprocable within the magazine and resiliently spring biased into the nose piece passage to support the screw in the ready position with its axis aligned with that of the bit.

The length of the nose piece passage exceeds that of the screw so that a screw in the ready position is completely enclosed within the passage. When the forward end of the nose piece is pressed against a surface into which the screw is to be driven, the housing is shifted rearwardly relative to the tool, thus advancing the tip of the bit forwardly toward the head of the screw to be driven. During this initial advancing movement of the bit toward the screw, cooperating cam surfaces on the bit and insert member engage each other to shift the in-

sert member clear of the passage as the bit moves into engagement with the screw. In this manner, the screw is released from the magazine as it is engaged with the bit and further rearward movement of the housing causes the bit to axially advance the screw through the nose piece passage into engagement with the screw receiving surface. Rearward movement of the housing relative to the tool is limited by a stop or set screw engageable between the housing and the adapter unit, this engagement occurring when the screw is fully seated to the desired depth in its receiving surface.

Upon return of the housing to its forward end limit of movement, the screwdriver bit is retracted from beneath the screws and insert member, at which time the insert member is spring biased back into the passage and the array of screws is spring biased to position a new screw in the ready position for the next screw placing operation.

The end of the nose piece is projected forwardly from the front end of the housing and is smoothly curved to form a dimple or depression in the drywall surface to allow the screw head to be slightly countersunk into the drywall for subsequent concealment, without tearing the paper surface of the drywall or sheetrock.

DRAWINGS

FIG. 1 is an isometric view showing a screw magazine mechanism embodying the present invention installed upon a power screwdriver;

FIG. 2 is an enlarged side elevational view of the screw magazine mechanism of FIG. 1, showing a forward portion of the screwdriver in partial schematic cross-section;

FIG. 3 is a front elevational view of the screw magazine mechanism shown in FIG. 2;

FIG. 4 is an enlarged detail rear elevational view, with certain parts broken away, of a portion of the mechanism shown in FIG. 2, and showing particularly a latch assembly on the magazine screw clip;

FIG. 5 is an enlarged section view taken substantially in the plane of line 5—5 on FIG. 3;

FIG. 6 is an enlarged section view taken substantially in the plane of line 6—6 on FIG. 3;

FIG. 7 is an enlarged section view taken substantially in the plane of line 7—7 on FIG. 3;

FIG. 8 is a section view taken substantially in the plane of line 8—8 on FIG. 7;

FIG. 9 is a section view taken substantially in the plane of line 9—9 on FIG. 7;

FIG. 10 is a section view taken substantially in the plane of line 10—10 on FIG. 7;

FIG. 11 is a detail isometric view of the lower end portion of the insert member;

FIGS. 12, 13 and 14 are partial section views, similar to FIG. 7, and showing the sequence of operation in driving a screw;

FIG. 15 is an isometric view of the lower end portion of the magazine clip;

FIG. 16 is an isometric view, partially broken away, of a screwdriver bit;

FIG. 17 is an isometric view, partly broken away for clarity of illustration, of an array of screws held in a disposable dispenser or holder; and

FIG. 18 is a section view taken substantially in the plane of line 18—18 on FIG. 17.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring initially to FIGS. 1 and 2, a screw magazine mechanism, designated generally at 20, is shown operatively mounted upon a power driven screwdriver, designated generally at 22, of a commercially available construction. The power screwdriver 22 may be powered, for example, by compressed air or electricity. Referring to FIG. 2, nearly all power driven screwdrivers of the type with which the present invention is concerned are constructed with a tool case 30 housing a normally disengaged clutch, schematically illustrated in FIG. 2 as including a drive plate 24 coupled directly to the motor (not shown) and engageable with a driven plate 26 coupled to a chuck or bit. A spring means 28 biases the driven plate 26 forwardly away from the drive plate 24 so that the bit is normally rotatively uncoupled from the motor. When the bit is pressed axially rearwardly into the tool case 30, the driven plate 26 is engaged with the drive plate 24 to transmit rotation to the bit, rotary drive of the bit being possible only when sufficient pressure is applied to the bit to maintain the two clutch plates 24 and 26 in engagement. This arrangement allows the bit to be engaged in the slotted head of a screw while the tool motor is running with no rotary force being applied to the bit until the bit presses the seated screw quite firmly against a surface into which the screw is to be driven.

As best seen in FIGS. 2 and 7, the magazine mechanism 20 includes an adapter sleeve 32 which is fixedly mounted, as by set screws 34, upon a fixed or stationary portion of the end of the case 30 of the power driven screwdriver. The shape or configuration of the lefthand end of the adapter 32 will vary in accordance with the shape and configuration of the particular make or model of the power driven screwdriver 22 upon which the adapter 32 is to be employed. The function of the adapter sleeve 32 is to provide a cylindrical extension on the forward end of the tool coaxial with the screwdriver bit 36. To this end, the adapter sleeve 32 defines a central bit receiving passage 38 and a bushing 40 within which the bit 36 is received for both rotary and axial sliding movement. A sleeve-shaped housing 42 is slidably mounted upon the forward end of the adapter 32 in surrounding relationship therewith and is normally biased to a forward end limit of movement relative to adapter 32 by an interposed spring 44 engaged between an exterior flange 46 on the adapter 32 and an internal flange or shoulder 48 on the housing 42. To limit forward movement of the housing 42 relative to the adapter 32, a collar 50 is secured to the rearward or lefthand end of the housing 42, as viewed in FIG. 7, and is engageable with the flange 46. In order to establish a rearward end limit of movement of the housing 42 related to the adapter 32, there is provided at the forward end of housing 42, a threaded set screw or stop screw 52 mounted in a tapped bore 54 in the housing and engageable with the forward end of the adapter sleeve 32 (see FIG. 14).

A generally cylindrical nosepiece 56 is mounted within a bore 58 in the forward end of the housing 42 and is detachably secured in place by set screws 59 (see FIGS. 1 and 2). The nosepiece 56 is formed with a central passage 60, the internal diameter of which passage 60 being substantially equal to that of the head of a screw S. As best seen in FIGS. 7 and 12 through 14, the

passage 60 is located in coaxial alignment with the bit 36 and functions both to locate a screw S in coaxial alignment with the bit 36 and to guide the screw S in axial movement as the screw is being emplaced in a wall, panel or the like.

A supply of screws S is contained as an array within a magazine clip 68 mounted in the forward end of the housing 42. To accommodate movement of the screws into the nosepiece 56, a generally T-shaped slot 64 is cut downwardly through the forward end of the housing 42 and a corresponding slot 66 is cut downwardly into the nosepiece 56 (FIGS. 7, 8 and 10). The clip 68 is detachably locked in position on the housing 42 in juxtaposition with the slot 64 by a sliding pin-type lock received within a transverse bore 70 (FIG. 8). The lock assembly includes a pin member 72 slidably received in bore 70 and releasably latched in the locking position, as shown in FIG. 8, by a first spring loaded detent 74. When in the position shown in FIG. 8, a shoulder 76 on the pin 72 is received within a complementary recess 78 (see FIG. 15) in the magazine clip 68 from the housing 42. The locking pin 72 is then pushed upwardly (as viewed in FIG. 8) to a release position established by a second spring loaded detent 80, at which point the shoulder 76 is withdrawn clear of the clip 68 so that the clip may be lifted upwardly and out from the slots 64 and 66.

The magazine clip 68 is formed by an elongate main frame member 82 defining a longitudinally extending slot 83 of undercut T-shaped configuration within which it is slidably received an elongate screw retaining insert member 84. The insert member 84 may be formed from a sheet metal strip having opposite longitudinal side edge portions bent inwardly to define an elongate passage or slideway having an internal cross-sectional configuration closely conformed to the cross-sectional configuration of the head of the particular screw S which is to be carried by the clip. As best seen in FIG. 5 and 8, the shank of each screw S projects forwardly from the insert member 84 through the slot 83, while the head of the screw is retained by the member 84 and constrained thereby against all movement other than sliding movement longitudinally of the clip 68. Because in dry-wall installation the screwhead must be lightly countersunk for subsequent concealment, specially designed flathead screws are employed. The heads of the screws are in engagement with the insert with the screwhead being guided within the passage defined by the insert member 84 so that the screw axes are maintained parallel to each other.

A compression spring 86 (FIG. 7) is engaged between a cap 88 fixedly mounted on clip frame 82 and the upper end of the insert member 84 to resiliently bias the member 84 downwardly as viewed in FIG. 7 to project its lower end into the passage 60 defined in the nose piece 56. The lower end of insert member 84 is formed with a semicircular recess 90 cut in the flat or inner wall thereof, the radius of the recess 90 being approximately equal to that of the head of the screw S. Referring now to FIG. 10, it is seen that when the clip 68 is in its seated position in the housing 42, the insert member 84 is resiliently biased to a position such that the center of the semicircular recess 90 is spaced downwardly below the axis of the lowermost screw S and that the head of the lowermost screw S is thus still partially retained within the insert member 84. A J-shaped lift or cam member 92 is secured to the rearward side

of the insert member 84 adjacent the semicircular recess 90, the lower most portion of the lift member 92 being generally tangent to a plane which contains the uppermost point of the semicircular recess 90. Referring particularly to FIGS. 7, 12, and 16, it is seen that a conical bevelled surface 94 is formed adjacent the forward end of the screwdriver bit 36, and from a comparison of FIG. 7 and 12, it is seen that as the bit 36 is advanced axially toward the lowermost screw S in the clip, the surface 94 engages the J-shaped lift hook 92 so that advancement of the bit 36 causes the surface 94 to cam the insert member 84 upwardly from the position shown in FIG. 10 to thereby release the lowermost screw S from the insert member 84 as the screwdriver bit 36 moves into operative engagement therewith and drives the screw into the panel to be fastened, as illustrated in FIGS. 12, 13 and 14.

The array of screws S received and retained in the insert member 84 are resiliently biased downwardly by a pusher member 96 (FIG. 7 and 9) slidably received within the screw channel defined in the insert member 84. The pusher member 96 is resiliently biased downwardly, as viewed in FIG. 7, by a compression spring 98 acting between the frame cap 88 and a finger block 100 fixed to the pusher block 96, and slidably mounted on the clip frame 82. A telescopic rod 102 passing centrally through the coils of the spring 98 serves as a guide for the spring 98, while a spring loaded latch 104 pivotally mounted on the clip frame 82 is releasably engageable within a notch 106 (FIG. 4) on the finger block 100 to latch the pusher member 86 in its upper or nonoperative position while a set of screws S is being loaded into the clip 68. For purposes of guiding the finger block 100 on the clip frame 82 for sliding movement therealong, the opposed lateral edges of the clip frame 82 are provided with notches 108 cooperatively and slidably receiving turned flange members 109 on the finger block 100.

For holding the remaining screws in the magazine from sliding downwardly into the passage 60 during driving operation of a screw, the J-shaped member 92 is formed of slightly resilient spring-like material and is secured at the upper end of its main leg to the insert member 84. The positioning of the J-shaped member 92 is such that it is secured at its upper end, and slightly spaced at its lower end from the backwall surface of the insert member 84. When the J-portion cam surface of the member 92 is engaged by the conical bevelled surface 94 on the forward end of the screwdriver bit, the J-shaped member is springingly flattened towards the back surface of the insert member 84. For purposes of engaging the head of a screw sliding down within the magazine insert, the J-shaped member is provided with a pair of projecting tangs 110 stamped or bent out of the main leg portion adjacent the cam surface thereof. The tangs are positioned to project through slots 111 cut in the back wall of the insert member 84 so as to project into the screw path. As the tangs project into the path of the screws in the magazine, they engage and hold the head of the screw immediately above the screw being driven by the screwdriver bit and hold it from sliding further down into the mechanism and jamming against the rotating screwdriver bit.

In order to load an array of screws S into clip 68, the clip 68 is first removed from the housing 42, this being accomplished by shifting locking pin 62 to its release position and withdrawing the clip 68 upwardly clear of

the slots 66 and 64. The pusher block 96 is then drawn upwardly against the action of the spring 98 by pulling upwardly on the finger block 100. The finger block 100 is latched in a retracted position by engagement of the latch 104 in the notch 106 as illustrated in FIG. 4. The screws to be loaded are then inserted by sliding them into the lower end of the slot defined in the insert member 84. The loading operation may be speeded by previously preparing unit groups of screws in which the screws are arrayed in aligned side-by-side position by a strip of tape, a plastic holder, or like removable holder, the array of screws being slid into insert member 84 as a unit and the tape or holder then being detached and discarded. An illustrative disposable screw holder is shown in FIGS. 17 and 18 and comprises a generally channel shaped plastic strip 112 holding an array of screws S. The strip 112 may be of relatively soft or flexible plastic to facilitate separation from the screws. The screws S are threadably held by the web 114 of the strip 112 with the side walls or legs 115 housing and protecting the screw threads. The free ends 116 of the channel legs further assist and guide the insertion of the heads of the screws S into the insert member 84. After the screws are inserted into the insert member 84 and the screw heads are held therein, the holder 112 can be easily and quickly stripped away leaving the array of screws in position for immediate use in the screw magazine.

The lowermost screw is hand held to prevent it from dropping out of the clip, or alternatively the clip is held in a horizontal position with the screws pointing upwardly, and the screw-loaded clip 68 is then replaced in the housing 42 and locked in place by manipulation of the locking pin 72. The latch 104 is then released so that the spring 98 drives the pusher member 96 downwardly into contact with the uppermost screw in the clip. At this stage, the position of the apparatus is that shown in FIG. 7 with the lowermost screw S located in a ready position coaxially aligned in the passage 60 with its head spaced slightly forwardly from the tip of the bit 36. The ready position of the lowermost screw is established by the engagement between the lowermost portion of the screwhead, as viewed in FIG. 7, with the wall of the passage 60, and with the insert member 84 projecting downwardly into the passage and still partially retaining the screwhead to thus support the screws S with its axis co-axial with the passage 60 and the bit 36.

As an alternative, the insert member 84 may itself be formed of an expendable disposable material such as plastic, and pre-loaded with array of screws. The operator then need only discard an empty insert and place a new one loaded with screws into the clip frame 82. Each disposable insert member would be formed with the screw receiving slot as well as with an integrally formed J-shaped cam member thereon.

When the magazine is loaded and in position on the screw driver, the nosepiece 56 is then firmly placed into position against a dry wall sheet to be screw-mounted. The screwdriver motor is started, and the tool pushed forwardly to drive a screw. Referring now particularly to FIGS. 12, 13 and 14, as the tool is pressed forward, the bit 36 is advanced into engagement with the lowermost screw S, the conical camming surface 94 of the drill bit engaging and camming the J-shaped member 92 upwardly to raise the insert member 84 upwardly away from the screws S being driven. The bit tip thus passes under the insert member 84, with the

J-shaped cam and semicircular recess 90 at the bottom of the insert member 84 riding upon the shank of the bit during further advancement of the bit to drive a screw. The initial engagement of the bit with the screw is shown in FIG. 12, while FIG. 13 illustrates a subsequent point in the operation at which the screw is partially seated. During movement from the position shown in FIG. 12 to the position shown in FIG. 13, sufficient resistance to forward axial movement of bit 36 is encountered to engage the clutch plates 24 and 26, thus effectively driving rotation of the screw. The tool is pressed forwardly to the position shown in FIG. 14, at which point the set screw 52 engages the adapter 32 to prevent further forward movement of the tool. The bit, however, will continue to drive the screw until the axial forward movement of the screw reduces the consequent rearward pressure on the bit 36 to a point at which the clutch plates of the power screwdriver are disengaged.

It will be noted that the slight protuberance of the forward end of the nosepiece 56 has created, during the screw seating operation, a slight depression in the outer paper layer of the wall board, drywall or sheetrock so that the head of the seated screw is countersunk inwardly from the general plane of the outer surface of the wall. The tool is then withdrawn from the wall, and as the bit 36 retracts to its original position, the spring 86 drives the insert member 84 back into the passage 60 while the spring 98 at the same time acts through the pusher member 96 to advance the row of screws S within the insert member 84 to position the next screw in the ready position.

Changeover of the apparatus to operate with a different sized screw is accomplished by changing the nosepiece 56 and insert member 84, the remaining parts of the apparatus being usable with screws falling within the size ranges normally encountered in dry wall or sheetrock installation. Adjustment of the setscrew 52 is required when changing from screws of one length to screws of a differing length.

While the capacity of magazine clip 68 may be limited, for example to approximately one dozen screws at a time, such a limited capacity is not necessarily a drawback in dry wall installation since about twelve screws will adequately secure a sheet of dry wall board in position and the magazine can readily be reloaded while the next sheet is being moved into position. The spring biased action of the magazine enables the tool to be held in any position without interfering with operation of the feed mechanism thus enabling the tool to be twisted or turned where clearance problems are encountered and also making the tool usable for the installation of ceiling panels.

While the present invention is useful in a variety of applications, it is especially well adapted for use in the installation of dry wall or sheetrock on sheet metal studs, and has been described specifically in conjunction with this particular application. The most commonly employed sizes of dry wall sheet are four feet by eight feet and four feet by twelve feet, and the substantial weight and limited resistance of these sheets to bending make these sheets difficult to handle. During installation it is necessary that the sheet be held in the desired position with its edges plumb until sufficient fasteners have been placed to hold the sheet in position. Typically, this operation requires two or three men per sheet, with at least one man occupied solely in

holding the sheet in position. Further, it is frequently necessary to set screws in corners or adjacent the juncture of a wall and ceiling where the adjacent surface may interfere to some extent with the tool unless the tool is placed in a particular position.

From the standpoint of labor economy, it is obviously desirable to set sufficient fasteners to hold the sheet in position as rapidly as possible. In order that the finished wall surface be smooth and uninterrupted, it is necessary that the fastener head be countersunk slightly inwardly of the general plane of the panel surface so that it can be subsequently concealed by taping and spackling. The gypsum core of the dry wall sheets possesses little structural integrity in itself when the paper outer layer is punctured or torn, and hence, where a power driven screw is employed as the fastener, care must be taken to set the screw deep enough so that its head is slightly countersunk, but not so deep that the paper is torn away from the puncture in the paper formed in the passage of the screw. The depth set adjustments which the present invention affords enables the user to accurately determine the depth to which the screw will be driven, and the insertable nosepiece affords the desired countersinking effect to avoid tearing the paper layer.

The screw magazine assembly of the present invention further requires a minimum of lubrication, and is constructed and arranged so as to avoid fouling by dust and plastic particles created during the driving operation. It is quickly and easily loaded with screws, and an installer can efficiently and accurately secure panels in place with a minimum of time and effort.

While the embodiment of the invention has been described, it should be understood that there is no intention to limit the invention to the specific form or use described. On the contrary, the intention is to cover all modifications, alternative constructions, equivalents and uses falling within the spirit or scope of the invention as expressed in the appended claims.

I claim:

1. A screw magazine mechanism for use with a power driven screwdriver, said screwdriver having a case, a screwdriver bit rotatably mounted in said case and projecting forwardly therefrom for engagement with a screw to be driven, drive means for rotating said bit, and clutch means for drivingly coupling said drive means to said bit upon the application of a predetermined axially rearwardly directed force upon said bit; said screw magazine mechanism feeding screws in succession into operative alignment with said screwdriver bit, and comprising in combination:

an adaptor member fixedly mounted upon said case and projecting forwardly therefrom in coaxial alignment with said bit;

a housing mounted upon said adapter for axial sliding movement relative to said bit and said adapter between a forward end limit of movement wherein said bit is spaced rearwardly from the forward end of said housing by a distance greater than the length of a screw to be driven and a rearward end limit of movement wherein said bit projects from the forward end of said housing;

spring means engaged between said adapter and said housing biasing said housing toward said forward end limit;

screw magazine means detachably mounted upon the forward end of said housing operable when said housing is at said forward end limit to position a

screw in a ready position wherein said screw is in axial alignment with said bit and with the head of said screw facing and spaced axially forwardly from the forward end of said bit; and

cooperating means on said bit and said magazine means operable upon rearward movement of said housing relative to said adapter and said bit for releasing said screw from said magazine as said bit moves into engagement with the head of said screw.

2. The screw magazine mechanism defined in claim 1 further comprising a nosepiece mounted at the forward end of said housing and having a passage therethrough axially aligned with and adapted to rotatably receive said bit, said bit having a shank of a diameter substantially equal to the diameter of the head of said screw and said passage having a diameter substantially equal to that of the shank, said nosepiece having a radially extending slot through a wall thereof opening into said passage for accommodating the transfer of a screw from said magazine into said passage in a position wherein said screw in said ready position is located coaxially within said passage.

3. The screw magazine mechanism defined in claim 2 wherein the forward end of said nosepiece defines an annular convex protuberance coaxial with said passage for engaging a surface into which a screw is to be driven thereby to form a concave depression in said surface surrounding said driven screw.

4. The screw magazine mechanism defined in claim 2 wherein said screw magazine means comprises an elongate frame defining a longitudinal channel therein, an elongate insert member slidably mounted in said frame and adapted to receive and retain an array of screws extending longitudinally along said insert member, said insert member having an opening at one end thereof accommodating removal and insertion of said screws, first spring means on said frame operable to bias screws in said insert member towards said one end of said member, said magazine receiving means supporting said magazine means on said housing to locate said one end of said insert member adjacent said passage with said insert member projecting radially from said housing through said slot and with said first spring means biasing the endmost screw in said insert member to said ready position.

5. The screw magazine mechanism defined in claim 4 wherein said housing includes means for detachably mounting said frame in a fixed position thereon, and said frame includes second spring means engaged between said frame and said insert member for resiliently biasing said insert member to position said one end thereof into said passage when said frame is in said fixed position on said housing.

6. The screw magazine mechanism defined in claim 5 wherein said cooperating means between said bit and said magazine means includes means on said insert engageable by said bit upon movement of said bit toward a screw in said ready position for shifting said insert against the biasing force of said second spring means thereof to shift said one end of said insert member clear of said passage.

7. The screw magazine mechanism defined in claim 6 wherein said means on said insert engageable by said bit includes a stiffly resilient J-shaped cam member secured to the rear surface of said insert with the curved portion of said J-shaped cam member adjacent the

lower end of said insert in position for camming engagement with the screwdriver bit upon forward movement thereof.

8. A screw magazine mechanism for use with a power driven screwdriver, said screwdriver having a case, a screwdriver bit rotatably mounted in said case and having a tip portion projecting forwardly therefrom for engagement with a screw to be driven, and drive means for rotating said bit, said screw magazine mechanism comprising, in combination:

an adapter sleeve member adapted to be fixedly mounted on the power screwdriver case in coaxial partially coextensive surrounding relationship with the screwdriver bit and with the screwdriver bit tip portion projecting axially therefrom;

a magazine housing sleeve slidably mounted on said adapter for axial sliding movement thereon between forward and rearward end limits;

screw magazine means detachably mounted on said housing adjacent the forward end thereof and operable when said housing is at its forward end limit to position a screw within the forward end of said housing in axial driving alignment with the screwdriver bit for engagement between the bit tip and the screwhead;

and means operable upon rearward movement of said housing for releasing said screw from said magazine as said bit tip engages said screw head to drive said screw.

9. In a power screwdriver having a case, a screwdriver bit rotatably mounted in said case in forwardly projecting relation and having a tip for engagement with the head of a screw to be driven, drive means for rotating said bit, and a screw magazine mechanism on said case for feeding screws in successive operative alignment with said screwdriver bit, the improvement which comprises:

an adapter sleeve member fixedly mounted on said case and projecting forwardly therefrom in coaxial partially coextensive surrounding relation with said bit;

a housing sleeve mounted on said adapter for axial sliding movement thereon relative to said bit between a forward end limit of movement wherein said bit tip is spaced rearwardly from the forward end of said housing by a distance greater than the length of a screw to be driven and a rearward end limit of movement wherein said bit tip projects from the forward end of said housing;

means biasing said housing towards said forward end limit;

screw magazine means detachably mounted on said housing adjacent the forward end thereof said magazine means retaining an array of screws and operable when said housing is at said forward end limit to position a screw within said housing in forward axial alignment with said bit in ready position for driving engagement between the bit tip and the screw head;

and means operable upon rearward movement of said housing for releasing said screw from said magazine as said bit tip engages said screw head to drive said screw.

10. The improvement defined in claim 9 wherein said screw magazine means comprises an elongate frame defining a longitudinal channel opening into one end of said frame, an elongate insert member slidably

mounted in said frame channel and retaining an array of screws, said insert member having an opening at one end thereof accommodating removal of said screws one-by-one from said array, means on said frame operable to bias screws in said insert member toward said one end of said member to position a screw within said housing in forward axial alignment with said bit.

11. The improvement defined in claim 9 further comprising means on said screw magazine means adapted for camming engagement with the screwdriver bit as said screwdriver bit is moved forwardly relative to said screw magazine means for lifting the array of screws retained in said screw magazine means above said drivingly positioned screw to a position above and away from engagement with the forwardly moving screwdriver bit.

12. The improvement defined in claim 9 wherein said screw magazine means comprises an elongate frame defining a longitudinal channel opening into one end of said frame, an elongate insert member slidably mounted in said frame and adapted to receive and retain an array of screws, said insert member having an opening at one end thereof accommodating removal of individual ones of said screws, first spring means on said frame operable to bias said screws in said insert member toward one end of said member, second spring means interposed between said elongate frame and said insert member for biasing said insert member to position said open end thereof within said housing when said frame is mounted on said housing, and means on said insert for lifting said insert in opposition to the bias of said second spring means as the bit of said screwdriver moves forwardly relative to said housing to drive a screw.

13. The improvement defined in claim 9 wherein said housing sleeve defines a radially extending slot opening through a wall thereof for accommodating the transfer of a screw from the screw magazine means into position for engagement by the bit tip, means on said housing sleeve adjacent said radial slot for detachably retaining said screw magazine means, and said screw magazine means including a screw holding insert retaining an array of screws extending longitudinally therealong, and means for biasing said screws in said insert through said radial slot into position for engagement by the screwdriver bit.

14. The improvement defined in claim 13 wherein said screw magazine means further includes spring means operable to bias said insert through said radially extending slot, and means on said insert for camming engagement with the screwdriver bit as said bit moves forwardly relative to said screw magazine means to cam said insert upwardly away from said bit thereby to release the screw being driven from said insert.

15. The improvement defined in claim 14 wherein said means on said insert for camming engagement with said screwdriver bit includes means for engaging and holding the screws remaining in said insert as said insert is cammed upwardly by the engagement between said camming means and said screwdriver bit.

16. The improvement defined in claim 9 wherein said housing sleeve defines a bore opening through the forward end thereof, and a nosepiece removably mounted in said bore, said nosepiece defining a central passage adapted to receive a screw from said screw magazine and to guide said screw during driving operation of said bit, and said nosepiece further defining a rounded an-

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nular surface which protrudes from the forward end of said housing sleeve for engagement with the surface into which said screw is being driven to form a shallow depression in said surface surrounding a driven screw.

17. The improvement defined in claim 16 wherein said nosepiece is of a length sufficient to enclose a screw when said housing sleeve is at its forward end limit of movement and to permit projection of said bit tip when said housing sleeve is at its rearward end limit of movement.

18. The improvement defined in claim 17 wherein said nosepiece is replaceable according to the length of screw being driven.

19. The improvement defined in claim 9 including an adjustable stop means on said housing sleeve engageable with said adapter sleeve for limiting rearward movement of said housing sleeve relative to said adapter sleeve thereby to determine the limit of projection of said bit tip from the forward end of said housing.

20. The improvement defined in claim 19 wherein said stop means comprises a screw member threadably received in a threaded bore extending through said housing sleeve from the forward end thereof.

21. The screw magazine mechanism defined in claim 5 wherein said first and second spring means are spaced from said housing by a distance approximately equal to the length of the insert member.

22. The screw magazine mechanism defined in claim 4 wherein said elongate insert member is replaceable according to the character of the screw retained therein.

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23. The improvement defined in claim 12 wherein said first and second spring means are spaced from the housing sleeve by a distance approximately equal to the length of said insert member.

24. The improvement defined in claim 12 wherein said elongate insert member is replaceable according to the character of the screws retained therein.

25. For use with a power screwdriver having a case, a screwdriver bit rotatably mounted in said case in forwardly projecting relation and having a tip for engagement with the head of a screw to be driven, drive means for rotating said bit, and a screw magazine mechanism on said case for feeding screws in successive operative alignment with said screwdriver bit, wherein said screw magazine mechanism includes:

an elongated insert member for retaining screws to be driven, a screw supply means for loading said insert comprising a flexible channel shaped member, defining a web and opposed side walls, and an array of screws retained in said channel with the heads of said screws projecting from said channel and said channel legs enclosing the threaded shanks of said screws, said member being strippable from said screws when the heads of said screws are retained in the elongated insert member.

26. The screw supply means defined in claim 25 wherein said channel legs are positioned closely adjacent to the screw heads to guide the screw during insertion thereof into the screw magazine insert member.

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