Sept. 15, 1964 B. J. WALLIS 3,148,571

PRESS UNLOADER

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FIG. 1

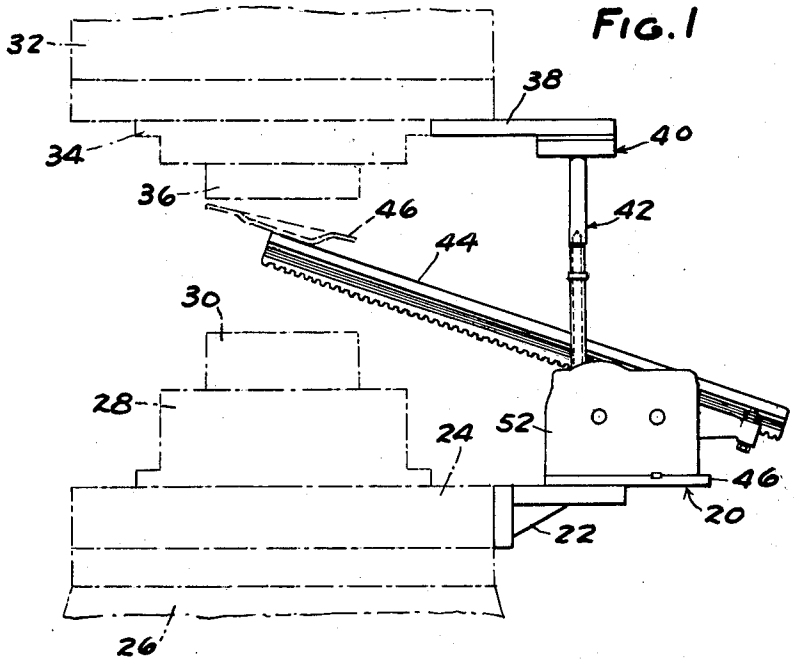
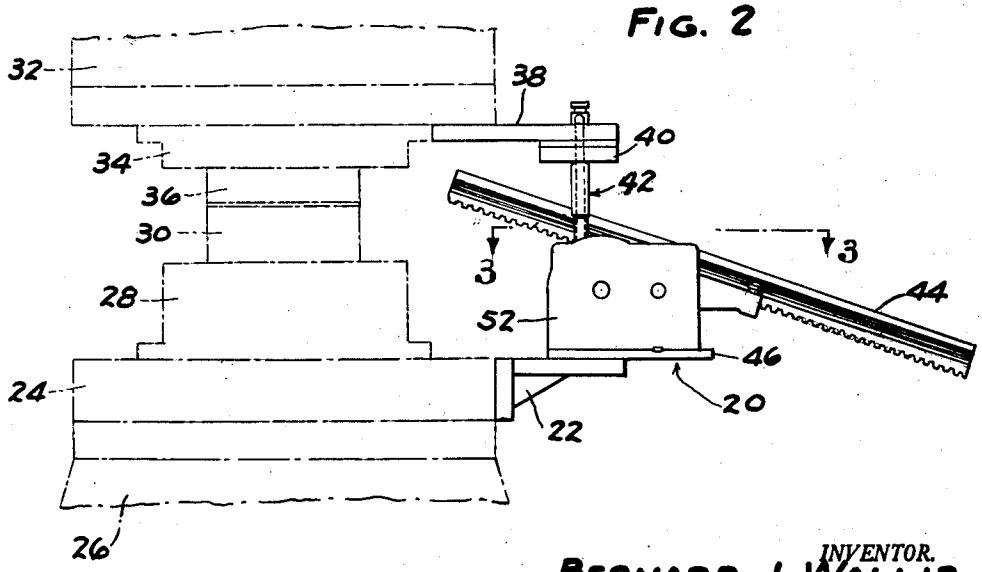


FIG. 2



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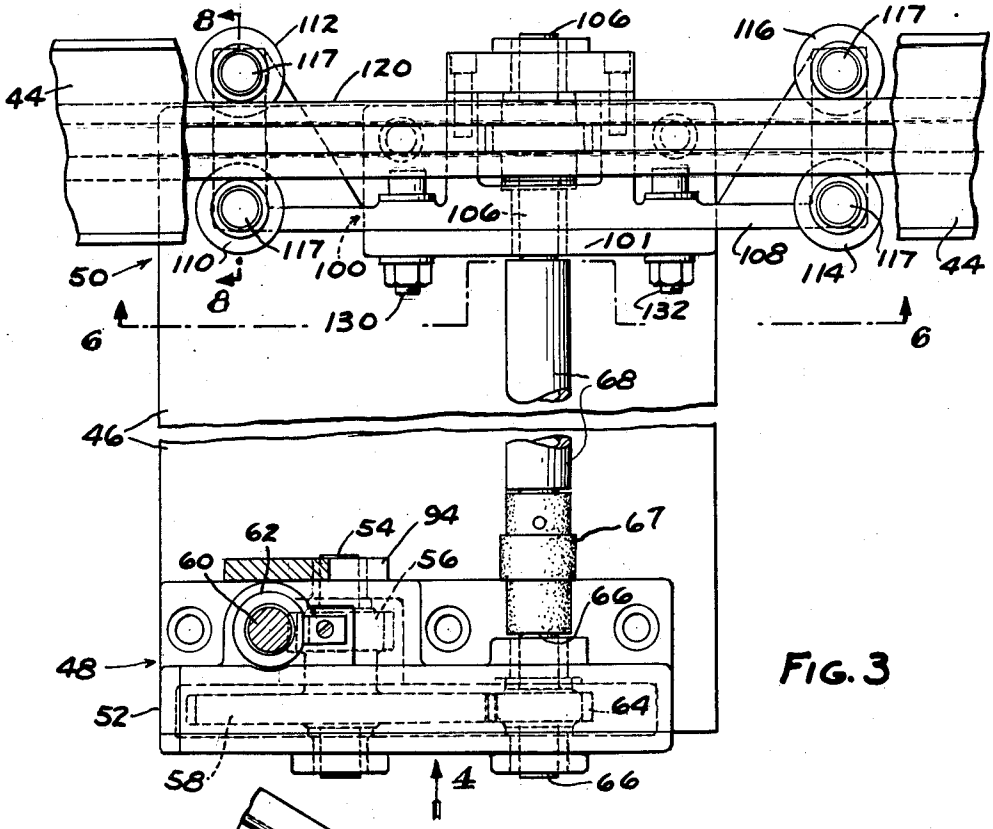


FIG. 3

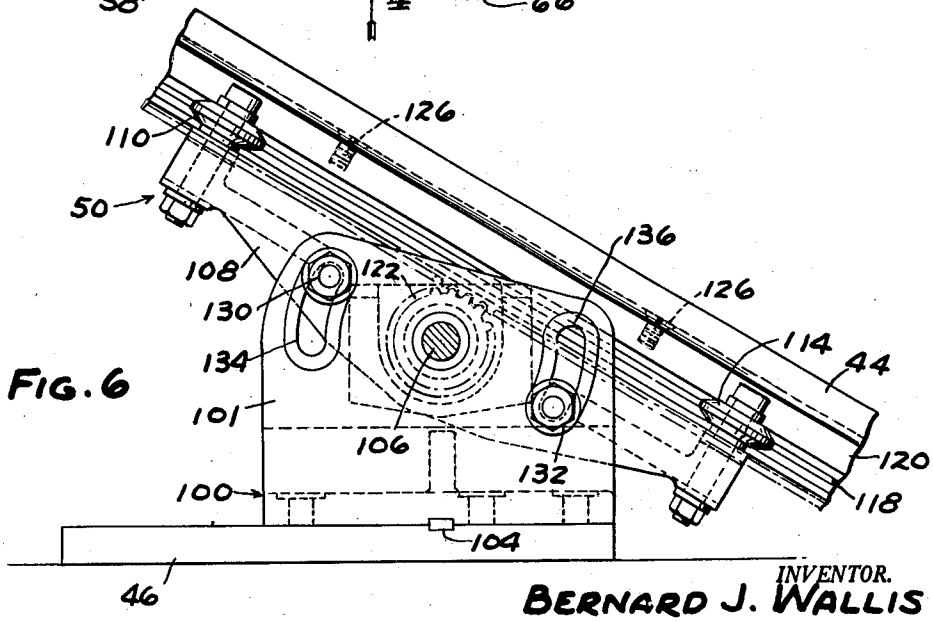


FIG. 6

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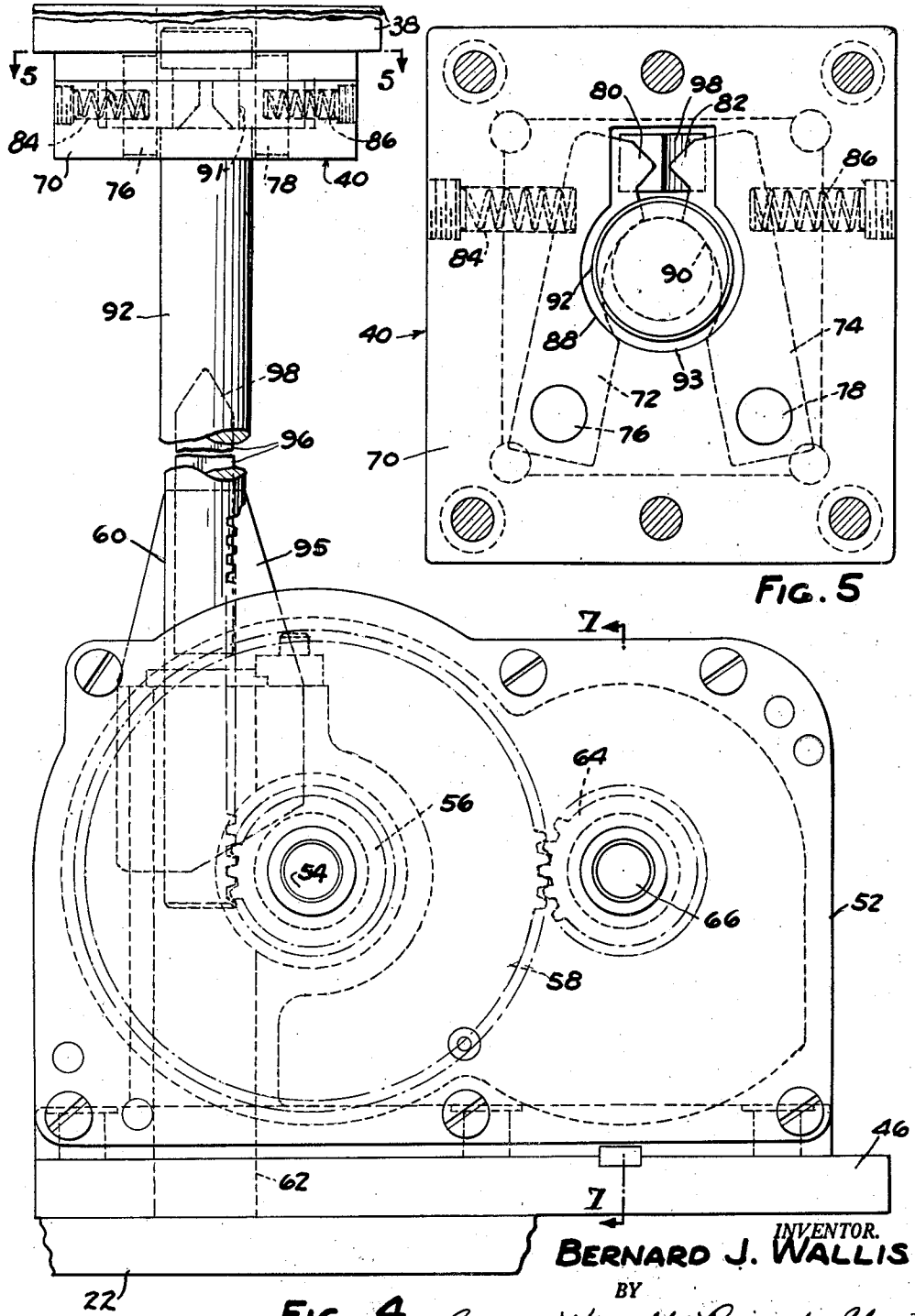


FIG. 5

FIG. 4

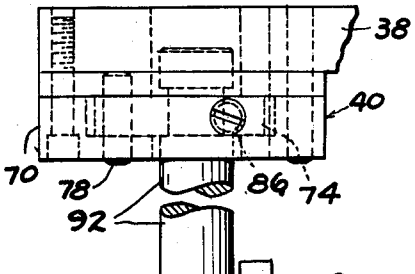
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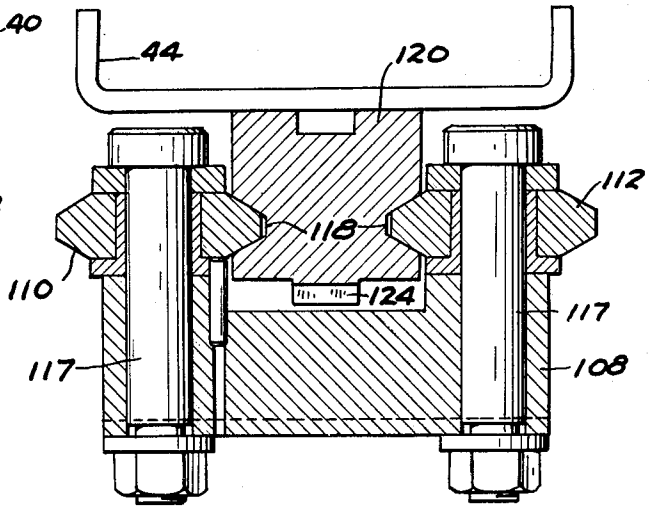
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PRESS UNLOADER

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FIG. 8





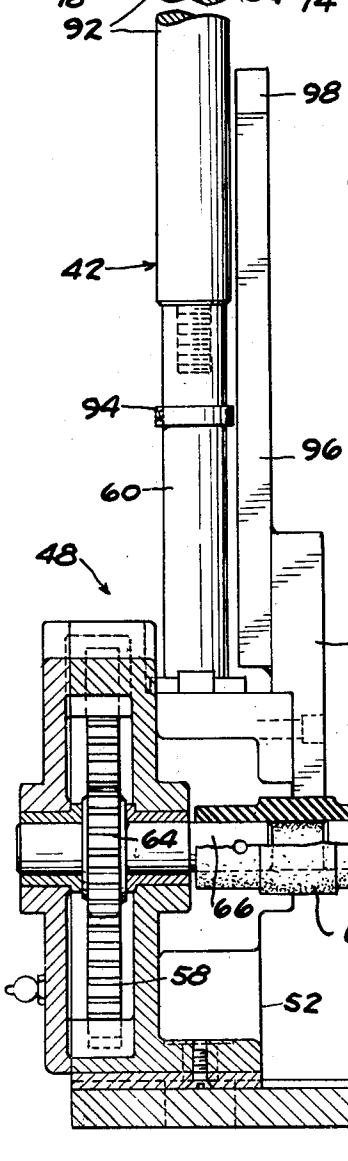
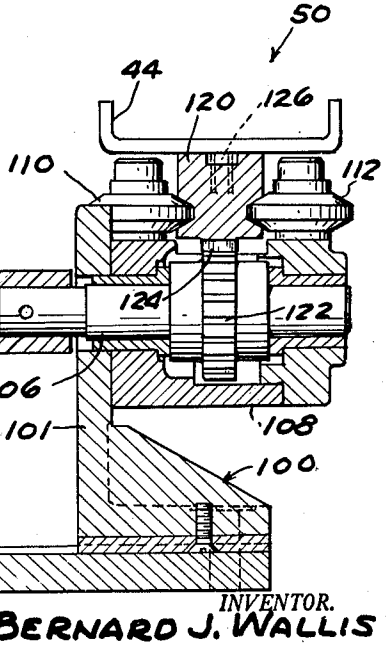


FIG. 7



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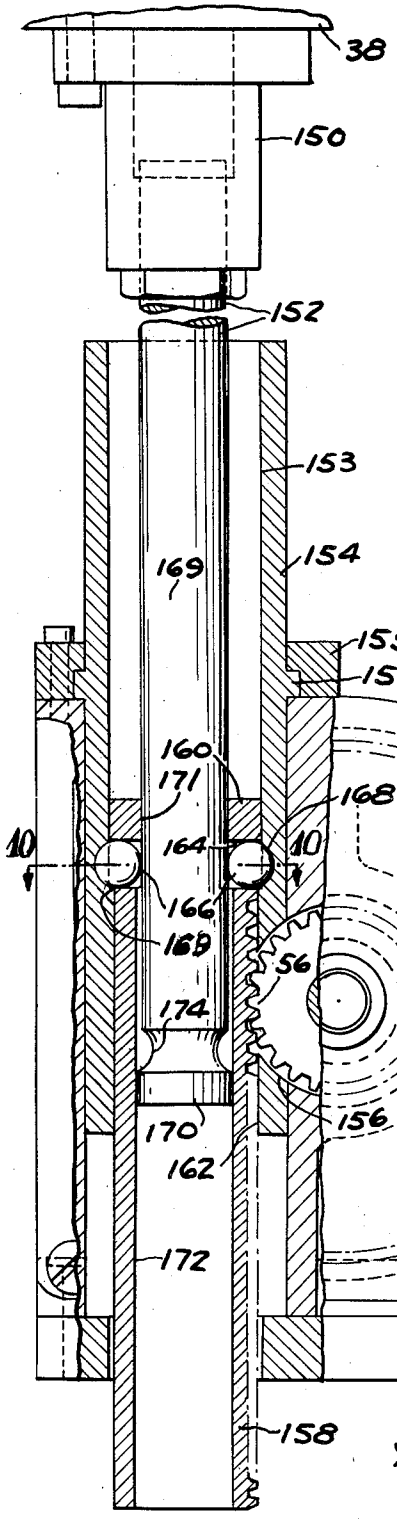


FIG. 10

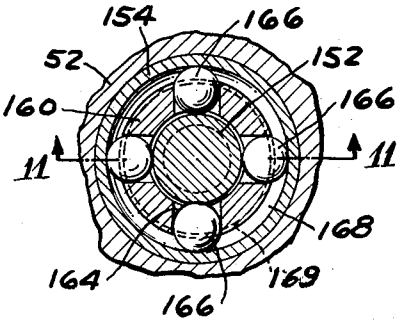


FIG. 9

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PRESS UNLOADER

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FIG. 11
COUPLED

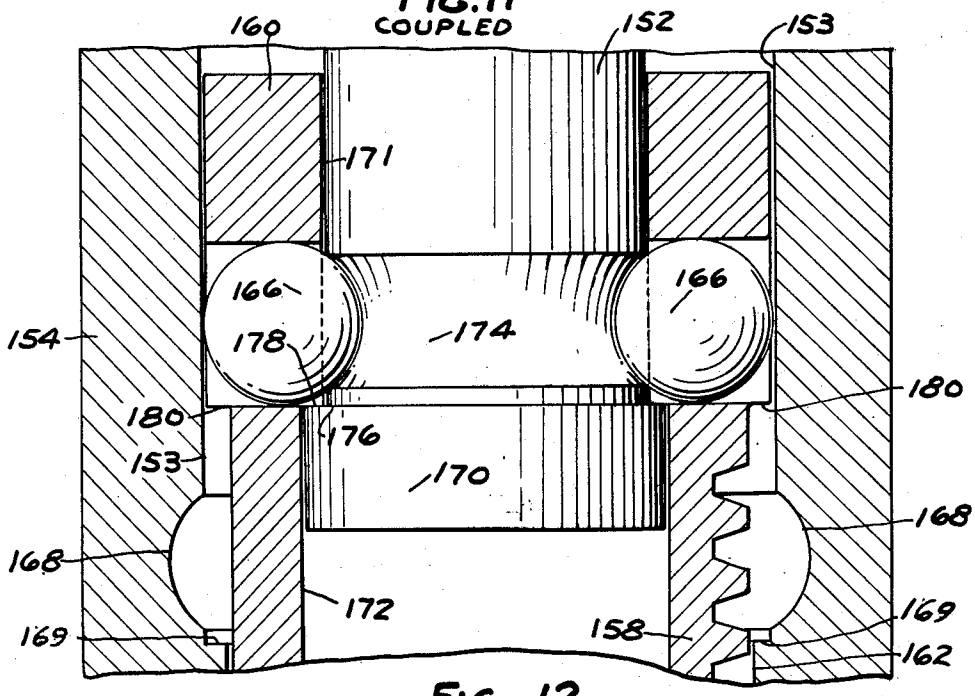
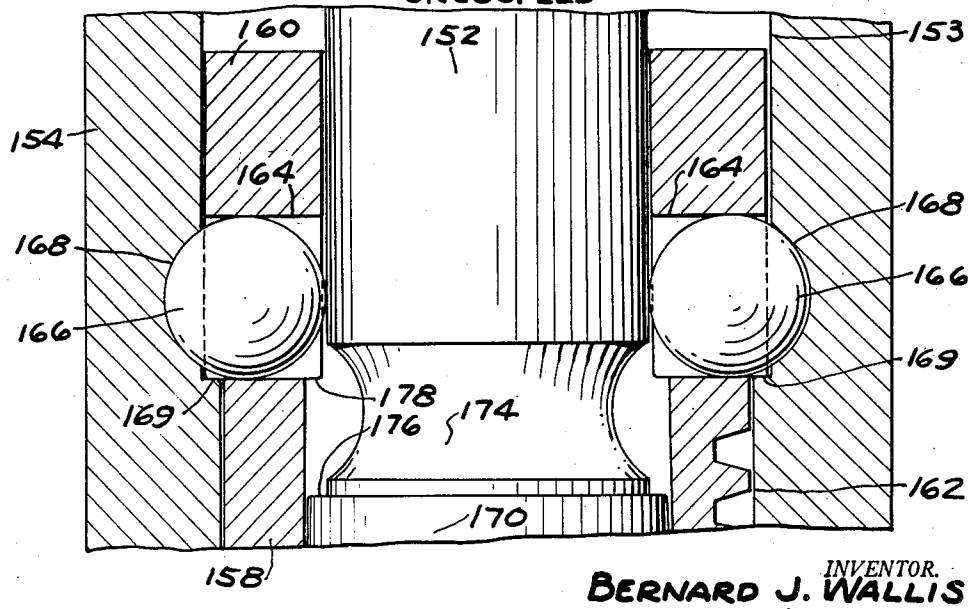


FIG. 12
UNCOUPLED



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United States Patent Office 3,148,571 Patented Sept. 15, 1964

3,148,571

PRESS UNLOADER

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Filed Nov. 6, 1961, Ser. No. 150,558
20 Claims. (Cl. 83—82)

The present invention relates to material handling equipment, and more particularly to a press unloader for mechanically unloading stampings or the like from between the dies of a press or similar machine without interrupting the operation of the machine.

The present invention is of particular utility in the unloading of a punch press in which the formed article is elevated with the upper die element as the press opens and is ejected downwardly from the upper die element by knockout pins which operate at the terminal portion of the upstroke of the press. The invention provides means for removing the part from between the upper and lower die elements of the press after it has been ejected by the knockout pins from the upper die element.

It is an object of this invention to provide an improved press unloader for automatically removing an ejected stamping from the press.

Another object of this invention is to provide a press unloader which is easily adaptable to a wide variety of punch presses, whether of long or short stroke, and which is capable of handling a large range of different shapes and sizes of stampings.

A further object is to provide a press unloader of the above character which may be permanently mounted on a press and yet which is adjustable to a wide range of setups with a minimum of time and effort.

Yet another object of the invention is to provide a press unloader which is positively actuated through a mechanical connection with the ram of the press but which utilizes only the upper portion of the press stroke to actuate the unloader, thereby reducing travel of the unloader to a minimum.

In the drawings:

FIG. 1 is an elevational view of a press unloader constructed in accordance with the present invention illustrating the transfer tray thereof in its extended position between the open dies of a punch press.

FIG. 2 is an elevational view similar to FIG. 1 illustrating the transfer tray in its retracted position and with the dies in closed position.

FIG. 3 is a fragmentary sectional view taken on the line 3—3 of FIG. 2 with a portion of the transfer tray broken away to illustrate details.

FIG. 4 is an elevational view looking in the direction of arrow 4 of FIG. 3.

FIG. 5 is a sectional view taken on the line 5—5 of FIG. 4.

FIG. 6 is a sectional view taken on the line 6—6 of FIG. 3.

FIG. 7 is a sectional view taken on the line 7—7 of FIG. 4.

FIG. 8 is a sectional view taken on the line 8—8 of FIG. 3.

FIG. 9 is an elevational view of the above press unloader illustrating a modified form of lost motion coupling to the press ram, also in accordance with the present invention.

FIG. 10 is a sectional view taken on the line 10—10 of FIG. 9.

FIG. 11 and FIG. 12 are greatly enlarged fragmentary sectional views taken on the line 11—11 of FIG. 10 illustrating respectively the engaged and disengaged relationship of the parts of the modified form of lost motion coupling.

Referring in more detail to the drawings, FIG. 1 illustrates a press unloader 20 of the present invention attached by a mounting bracket 22 to a suitable stationary portion, such as platen 24, of a punch press of conventional construction and shown in broken lines. The punch press includes a stationary base 26, a lower die shoe 28 mounted on platen 24, a die 30, a vertically movable ram 32, an upper die shoe 34 and a punch 36. The press unloader 20 is mechanically coupled to ram 32 of the press by a ram drive bracket 38 which supports a jaw structure 40 operable to provide a lost motion connection between ram 32 and a vertically extending driver 42 of unloader 20.

In general, as ram 32 of the press moves upwardly to the open position indicated in FIG. 1, a transfer tray 44 of the press unloader 20 is caused to move longitudinally into the cleared area between die 30 and punch 36 to receive the stamped work piece 46 which is dropped onto tray 44 by the action of conventional knockout or ejector pins (not shown) which kick the stamped part 46 out of punch 36. As ram 32 moves downwardly to the closed position of the press indicated in FIG. 2, tray 44 is caused to retract to clear the die area and transfer the part 36 to a basket or conveyor, not shown.

One of the features of the improved press unloader of the present invention resides in the arrangement of the power transmission or drive assembly thereof spaced from but adjustably interconnected with the tray assembly thereof. As shown in FIGS. 3 and 7, the entire press unloader unit 20 is mounted on a base plate 46, with a drive assembly 48 fixedly mounted at one end of base plate 46 and a tray assembly 50 adjustably mounted at the other end of the base plate. The individual functioning of these sub-assemblies as well as their cooperative relationship will be fully apparent from the following detailed description of their structure and operation.

Drive Assembly

Referring to FIGS. 3, 4 and 7, drive assembly 48 includes a gear housing 52 bolted on base plate 46 at one end thereof. Housing 52 is suitably cast and machined to form a journal support for a pinion shaft 54 (FIGS. 3 and 4) which has a pinion gear 56 and a larger diameter gear 58 mounted thereon. A vertically extending rack 60 of driver assembly 42 reciprocates in a vertical bore 62 of housing 52. Rack 60 engages and drives gear 56 which via shaft 54 in turn drives gear 58. A small spur gear 64 is mounted on a shaft 66 also journalled in housing 52 parallel with shaft 54, shaft 66 being driven by the engagement of gear 64 with gear 58. The inner end of shaft 66 (FIGS. 3 and 7) extends beyond housing 52 to receive a conventional rubber shock absorbing coupling 67 which is pinned at one end to shaft 66 and at the other end to a coupling shaft 68. In order to relate ram travel to tray movement, the drive ratio of drive assembly 48 is variable by interchanging suitable sets of gears 58 and 64.

Referring to FIGS. 4, 5 and 7, a lost motion connection is provided between rack 60 and ram bracket 38 by means of jaw structure 40. As shown in FIG. 5, jaw structure 40 includes a rectangular frame 70 which is bolted to the underside of bracket 38 and which contains a pair of jaws 72, 74 pivoted respectively on pins 76 and 78. Jaws 72, 74 have their free ends, 80 and 82 respectively, urged towards one another by a pair of compression coil springs 84, 86. The adjacent sides of jaws 72, 74 are concavely recessed at 88 and 90 respectively to engage within an annular groove 91 of a vertically extending coupling shaft 92 which passes through a keyhole-shaped center hole 93 of frame 70. As shown in FIG. 7, the lower end of coupling shaft 92 is threaded into the upper end of rack 60. A stroke adjustment collar 94 is affixed to rack 60 by a set screw to limit downward travel of rack 60. A bracket 95

bolted to the inner side of housing 52 supports an upright bar 96 having a pointed upper end 98 adapted to enter the rectangular portion of keyhole opening 93 to spread jaws 72, 74 out of engagement with coupling shaft 92.

The above lost motion coupling operates as follows: Assuming that ram 32 is at the top of its stroke and jaws 72, 74 are locked on shaft 92, initial downward movement of the ram drives coupling shaft 92 and rack 60 downward to drive the gears 56, 58 and 64. This causes the tray 44 to be retracted with the work piece therein out of the way of the downwardly moving punch 36. When the ends 80, 82 of jaws 72, 74 strike the pointed upper end 98 of bar 96 in their downward movement, they are cammed apart so that the upper end of coupling shaft 92 is disengaged from jaw structure 40. Either simultaneously with or soon after such disengagement, the adjustment collar 94 bottoms on the top of housing 52, thereby halting downward travel of rack 60 and shaft 92. Then, as the ram 32 continues its downward movement, the jaw structure 40 and ram bracket 38 are free to move downwardly relative to shaft 92 until the press is closed. This sequence is reversed on the upstroke of the press, the jaws 72, 74 clamping shaft 92 when they register with reduced groove 91 thereof. This recouples the ram to shaft 92 to pull rack 60 upwardly, thereby causing tray 44 of press loader 20 to extend between the open punch and die during the last portion of the upstroke of ram 32.

The above lost motion coupling between the press ram and press unloader thus utilizes only the upper portion of the press stroke to produce both the in and the out movement of transfer tray 44. This feature is advantageous for long stroke presses since it allows the tray to be placed closer to the die to thereby eliminate all unnecessary travel of the tray. In this arrangement, the height of the upper end of bar 96 in relation to the uppermost position of the press ram determines the extent of lost motion between the press ram and rack 60.

Tray Assembly

Referring to FIGS. 3, 6 and 7, the tray assembly 50 includes a right angle mounting bracket 100 which is bolted to base plate 46 at the end thereof remote from ram drive assembly 48. The position of bracket 100 on plate 46 is adjustable towards and away from drive assembly 48. A pinion shaft 106 is journalled in the upright wall 101 of bracket 100. Shaft 106 is axially aligned with and receives the driving end of coupling shaft 68, a pin connection being provided therebetween. Shaft 68 may be either axially adjustable or different lengths of shaft 68 may be provided for various lateral positions of bracket 100.

A tray support casing 108 is journalled on pinion shaft 106 for pivotable movement in a vertical plane relative to bracket 100. Two pairs of spaced rollers 110, 112 and 114, 116, individually journalled on bolts 117, are mounted with one pair at each end of tray support casing 108 (FIG. 3). The sides of rollers 110, 112, 114, 116 are tapered for rolling contact with the tapered surfaces of side grooves 118 of a rack bar 120 (FIGS. 7 and 8). The rollers 110, etc. support rack bar 120 for longitudinal movement and prevent cocking of rack bar 120 and hence tray 44 as it is extended into and retracted from the press. This movement of tray 44 is produced by coupling shaft 68 rotating a pinion gear 122 affixed to pinion shaft 106, gear 122 engaging a row of rack teeth 124 provided on the underside of rack bar 120. The transfer tray 44 is detachably mounted by screws 126 on the upper side of rack bar 120 and therefore is easily removable for replacement by trays of different widths and lengths to accommodate various shapes and sizes of work pieces 46.

Referring to FIGS. 3 and 6, tray support casing 108 is angularly adjustable relative to bracket 100 through an angle of about 30 degrees from the horizontal by the provision of tilt adjustment bolts 130 and 132 which extend through casing 108 and through a pair of arcuate slots 134, 136 provided in the upright wall 101 of bracket 100. It is to be noted that the mounting of tray support casing 108 for rotation about the axis of pinion shaft 106 permits the inclination of tray 44 to be varied as desired without disturbing the position of vertical gear rack 60.

It will be observed that gears 58, 64 comprise a set of change gears that can be selected to produce the desired extent of tray travel in relation to the extent of travel of vertical rack 60. This provides a convenient means for accommodating the unloader to different presses and also to different sets of dies in the same press. The tiltable tray 44 further enchances the versatility of the press unloader. As explained above, the tray support 108 can be tilted to the desired angle without affecting the vertical position of gear rack 60. With the tray support tilted to the desired position of adjustment and the change gears 58, 64 selected to produce the desired stroke and speed of reciprocation of the tray, the gear rack 120 is positioned in mesh with gear 122 so that the forward end portion of the tray will be properly disposed to receive the work piece ejected when the press ram is raised. It will be noted that the forwardmost position of tray 44 can be varied by either shifting the tray on support 108 or by loosening bolts 117 to permit rack bar 120 to be meshed with gear 122 in a different position of longitudinal adjustment.

Modified Form of Lost Motion Coupling

Referring to FIGS. 9 through 12, there is shown a modified form of coupling structure for interconnecting ram drive bracket 38 of the press with drive rack assembly 48 of the press unloader 20, like reference numerals being used to indicate like parts throughout the drawings. An adapter bracket 150 (FIG. 9) is bolted to the underside of ram drive bracket 38 and the upper end of a vertical drive shaft 152 is threadably mounted therein. Shaft 152 extends downwardly into the bore 153 of a vertical sleeve 154 fixedly mounted coaxially with shaft 152 in gear housing 52. Sleeve 154 is clamped on housing 52 by means of a collar 155 engaging a shoulder 157 on sleeve 154 and secured to housing 52 by screws as shown in FIG. 9. An axially extending slot 156 through the side of sleeve 154 permits the teeth of pinion gear 56 to travel partway into a reduced bore 162 of sleeve 154. An internal shoulder 169 forms a junction between bore 153 at the upper end of sleeve 154 and the reduced bore 162 at the lower end of sleeve 154. A vertical drive rack 158, comprising a hollow sleeve with rack teeth extending axially along the outer side thereof, is slidably mounted for vertical reciprocation in sleeve 154 with the teeth of drive rack 158 in engagement with those of pinion gear 56. The upper end 160 of drive rack 158 is enlarged for a close sliding fit in bore 153 of sleeve 154 while the remainder of rack 158 is received with a close sliding fit in the reduced bore 162 of sleeve 154.

As shown in FIGS. 9 and 10, the enlarged upper end 160 of rack 158 is provided with four radially extending holes 164 spaced 90 degrees from one another and each adapted to receive a steel ball 165. An annular groove 168 is provided around the inner wall of sleeve bore 153 immediately above an internal shoulder 169 of sleeve 154. The groove 168 provides an annular pocket to receive balls 166 and thereby permit them to move radially outward in holes 164 until they just clear the cylindrical surface 169 of shaft 152 (FIGS. 9 and 12). The upper end of drive rack 158 is apertured as at 171 to receive the cylindrical surface 169 of shaft 152 with a sliding fit. The lower end 170 of shaft 152 is enlarged in diameter to fit in close sliding contact with the bore 172 of hollow drive rack 158. An annular groove 174 is formed between the lower end 170 and the cylindrical surface 169 of shaft 152. Groove 174, like groove 168, is semi-spherically contoured in radial cross section to receive balls 166. However, it is to be understood that grooves 168 and 174 may be otherwise shaped to receive and to cam balls 166 therebetween, and that various

forms of detents other than balls 166 may be used without varying from the present invention.

The operation of the above modified lost motion coupling structure is illustrated in the enlarged views of FIGS. 11 and 12. As in the first form of lost motion coupling, the purpose of the modified coupling structure is to drive press unloader 20 only during the upper portion of the stroke of the press ram. During the remainder of the ram stroke, the press unloader 20 is idle so that tray 44 remains stationary. Assume that ram 32 is beginning to move upwardly to raise punch 36 away from die 30. At this time, coupling shaft 152 is disengaged from drive rack 158 and the lower end 170 of shaft 152 is moving upwardly within rack bore 172 towards the balls 166 (FIG. 9). When the press has moved upwardly a sufficient distance to bring annular shaft groove 174 into registry with balls 166 (FIG. 11), an upwardly facing shoulder 176 at the lower end 170 of shaft 152 strikes a downwardly facing shoulder 178 formed at the junction of bore 172 with aperture 171 thereby exerting an upward pull on rack 158. The initial upward force on rack 158 exerts an upward force on balls 166. Since balls 166 are seated in sleeve groove 168, a reaction force results from fixed sleeve 154 which, due to the angle of contact of the ball with the groove 168, produces a radially inwardly component of force on the balls 166. This reaction force drives the balls radially inward in the holes 164 at the upper end of the rack 158 until the balls bottom in the annular groove 174 on shaft 152 (FIG. 11). The inward movement of balls 166 disengages rack 158 from fixed sleeve 154 and couples rack 158 to shaft 152. The upward movement of drive rack 158 causes tray 44 to move from the retracted to the extended position thereof during the last portion of upward travel of the press ram.

When press ram 32 begins to close from its fully open position indicated in FIG. 1, the coupling shaft 152 is in engagement with drive rack 158 through balls 166 which are held in bottomed position in shaft groove 174 by sleeve bore 153. The downward movement of rack 158 causes the tray 44 to be retracted from between punch 38 and die 30 during the first portion of downward travel of the ram. When the coupled shaft 152 and drive rack 158 reach the point where balls 166 register with the annular sleeve groove 168, an external downwardly facing shoulder 180 (FIG. 11) provided on rack 158 engages sleeve shoulder 170 so that travel of rack 158 is positively stopped. This initiates movement of shaft 152 relative to rack 158 which causes the upper surfaces of shaft groove 174 to press downwardly on the balls, resulting in a radial outward component of force on the balls which urges them radially outward into a bottomed position in sleeve groove 168. This movement clears the balls of shaft groove 174 and thereby uncouples shaft 152 from rack 158 to permit continued downward movement of shaft 152 relative to drive rack 158 during the remainder of the downward portion of travel of the press ram. The press unloader 20 is locked in this dwell portion of the press cycle by the balls 166 being held in the bottomed position in sleeve groove 168 by shaft 152 so that the balls hold drive rack 158 locked to the fixed sleeve 154.

From the above description, it will now be understood that a press loader constructed in accordance with the present invention provides a highly efficient device for removing work pieces from punch presses and similar machinery. Due to the location of drive rack assembly 48 separate from tray assembly 50, a wide range of lateral adjustment between the two assemblies is obtainable by merely interchanging one coupling shaft 68 for another. In addition, the adjustable spacing of the two assemblies permits attachment of trays 44 of various widths without readjustment of the press unloader. The travel of tray 44 at the start and finish of its longitudinal movement is adjustable by shifting it longitudinally on rack bar 120 without disturbing the vertical rack drivers 60 or 158. The tilt angle of tray 44 is also adjustable without disturbing the vertical rack drivers. Due to these features, the press unloader may be permanently mounted, if necessary, on a press without affecting efficiency of operation of either the press unloader 20 or the press.

The lateral adjustability of the driver rack and tray assemblies relative to one another also permits universal application of the press unloader to different types and sizes of presses. The provision of the lost motion coupling structure further increases the adapability of the press unloader and permits it to be easily changed from press to press or from job to job.

I claim:

1. In a press unloader, a support plate adapted to be mounted in a fixed position relative to the press, a drive assembly mounted on the support plate and operatively associated with the movable ram of the press, said drive assembly comprising a gear rack and a gear driven by the rack, a tray assembly also mounted on said support plate, said tray assembly comprising a gear drivingly connected with said drive assembly gear, a tray support mounted on said support plate for pivotal adjustment about the axis of said tray assembly gear as center, a tray supported on said tray support for reciprocating movement thereon and a gear rack on said tray meshing with said tray assembly gear and pivotable with said tray support.

2. The combination set forth in claim 1 wherein said rack on said tray has longitudinal grooves formed in opposite sides thereof, and wherein said tray support has guide rollers journalled thereon adjacent each side of said rack for rolling engagement with the grooves thereof to thereby movably support the rack on said tray support.

3. The combination set forth in claim 1 wherein said tray assembly includes a tray member detachably mounted on said last mentioned rack for movement therewith to receive and transfer parts from the press.

4. The combination set forth in claim 1 including means for providing self-operating a lost motion connection between a press ram and said drive assembly gear rack effective to actuate said drive assembly gear rack only during the upper portion of the stroke of the press ram.

5. The combination set forth in claim 1 wherein said drive assembly and said tray assembly are mounted in spaced apart relation on said support plate with said two gears in spaced coaxial relation and a coupling shaft extending axially between and interconnecting said two gears.

6. The combination set forth in claim 5 wherein said support plate includes an upright bracket thereon in which said coupling shaft is journalled adjacent the gear of the tray assembly, said tray support being pivotally mounted on said last mentioned bracket for limited rotation about said last mentioned gear as center and fastening means for adjustably connecting said tray support in fixed position on said bracket for adjusting the angle of inclination of said tray support relative to said bracket.

7. A press unloader comprising support means adapted for attachment to a stationary portion of a press, a drive assembly mounted on said support means and including a pinion gear journalled thereon, a tray assembly mounted on said support means and including tray means reciprocal in a direction transverse to the travel of a reciprocating portion of the press, means rotatably coupling said pinion gear with said tray assembly for converting rotational movement of said pinion into the reciprocal movement of said tray means, rack means reciprocably mounted on said drive assembly and having a toothed portion in driving engagement with said pinion gear and self-operating lost motion coupling means for effecting a positive connection between said reciprocating portion of the press and said rack means during the portion of the travel of the reciprocating portion of the press closest to the open position thereof, said lost motion coupling

means disengaging said rack means and said reciprocating portion of the press during the remaining portion of the travel thereof.

8. A press unloader comprising support means adapted for attachment to a stationary portion of a press, a drive assembly mounted on said support means and including a pinion gear journalled thereon, a tray assembly mounted on said support means and including tray means reciprocal in a direction transverse to the travel of a reciprocating portion of the press, means rotatably coupling said pinion gear with said tray assembly for converting rotational movement of said pinion into the reciprocal movement of said tray means, rack means reciprocably mounted on said drive assembly for movement in a direction parallel with the movement of the reciprocating portion of the press and having a toothed portion in driving engagement with said pinion gear, press bracket means adapted for interconnecting said reciprocating portion of the press with said rack means and self-operating lost motion coupling means for effecting a positive connection between said bracket means and said rack means during the portion of the travel of the reciprocating portion of press closest to the open position thereof, said lost motion coupling means disengaging said rack means and said bracket means during the remaining portion of the travel of the reciprocating portion of the press.

9. The combination set forth in claim 8 wherein said lost motion coupling means comprises an arm pivotably mounted in said bracket means for movement in a plane transverse to the path of movement of said rack means, said rack means having a portion adapted for engagement with said arm to establish a driving connection between said bracket and rack means, resilient means for urging said arm into engagement with said portion of said rack means, and means fixedly positioned in the path of travel of said arm so as to engage said arm and move the same out of engagement with said rack means to thereby uncouple said bracket means from said rack means at a predetermined point in the closing movement of said press and conversely to permit said arm to engage said portion of said rack means at said predetermined point during opening movement of said press.

10. The combination set forth in claim 8 wherein said drive assembly includes support means mounted thereon and having a passage with an internal shoulder and a recess formed therein, said rack means being slidably mounted in said passage of said support means and having an enlarged head portion adapted to abut said internal shoulder and further having a toothed portion having a larger bore extending therethrough opening coaxially into said head bore, said head portion having a radial passage connecting the bore therein with the outer circumference thereof and located to register with said support means recess when said rack means head portion abuts said support means internal shoulder, said lost motion coupling means comprising a shaft connected to said bracket means and extending coaxially into said bores of said rack means, said shaft having an external shoulder and further having a recess adapted to register with said radial passage in said head portion of said rack means when said external shoulder of said shaft abuts said internal shoulder of said rack means, and a ball receiver in said radial passage having a greater diameter than the length of said radial passage, said ball being driven out of said support means recess and into engagement with said shaft recess and said rack means by reaction force exerted on said ball by said support means recess when said shaft and rack means shoulders abut, said ball being driven out of said shaft means recess and into engagement with said support means recess and said rack means by force exerted on said ball by said shaft recess when said rack means head portion abuts said internal shoulder of said support means.

11. In a press unloader of the type including a receiprocable gear rack and a reciprocable tray operated by the rack for projection between the dies of a press when opened and for retraction from between the dies when they close, the combination of means adapted to move in response to reciprocation of the press ram, said rack including an abutment thereon, said means including a shiftable detent which, in one position thereof, is adapted to engage said abutment when in registry therewith to provide a positive driving connection between the press ram and the rack and means fixed on said unloader in the path of travel of said detent for shifting the detent out of engagement with said rack abutment at a predetermined point in the stroke of the ram.

12. The combination set forth in claim 11 wherein the detent is biased into engagement with said abutment and said last mentioned means is adapted to overcome the bias on said detent to disengage the detent from the rack.

13. The combination set forth in claim 12 wherein said abutment comprises an annular groove on said rack and said detent comprises a pair of jaws engageable with said groove, said last mentioned means comprising a cam adapted to separate said jaws.

14. In a press unloader, the combination of a support adapted to be mounted in fixed relation to a press having a movable ram, a tray adapted to reciprocate on said support from a position clear of the dies of the press to a position projecting between the separated dies when the press ram retracts, means including a drive gear for reciprocating said tray and means for providing a lost motion connection between the press ram and said drive gear comprising a pair of inner and outer telescopically engaged members, the outer member being fixed on said support and the inner member comprising a rack engageable with said drive gear, a rod telescopically engaged within said inner member adapted to reciprocate in response to reciprocation of the press ram, said rod having a shoulder thereon, said inner member having a shoulder therein engageable with the shoulder on the rod to establish a driving connection therebetween in response to movement of the rod in one direction corresponding to retraction of the press ram, said inner member also having an external shoulder and said outer member having an internal shoulder adapted to interengage the external shoulder on the inner member and thereby limit movement of the inner member in a direction opposite to said first mentioned direction and means for establishing a driving connection between said rod and said inner member when the external shoulder on the inner member is spaced axially from the shoulder on the outer member.

15. The combination set forth in claim 14 wherein said last mentioned means comprises an outer recess on said rod, an inner recess on the outer member and at least one radially extending passageway in said inner member, said recesses and said passageway being located on the respective members such that the radial passageway is aligned radially with the recesses when said two sets of shoulders interengage, and a radially shiftable detent in said passageway, said detent having a radial dimension greater than said passageway such that the detent engages within the recess on the shaft or within the recess on the outer member.

16. The combination set forth in claim 15 wherein said detent comprises a bearing ball and said recesses in axial section conform generally to the shape of said ball.

17. The combination set forth in claim 16 wherein said radial passageway has a radial extent greater than the radius of said bearing ball.

18. The combination set forth in claim 17 wherein said recesses comprise complementary annular grooves, there being a plurality of said radial passageways angularly spaced around the circumference of said inner member.

19. In a press unloader, the combination of a support adapted to be mounted in fixed relation to a press having a movable ram, a tray adapted to reciprocate on said support from a position clear of the dies of the press to

a position projecting between the separated dies as the press ram retracts to open the press, a drive gear for reciprocating said tray and means for providing a lost motion connection between the press ram and said drive gear comprising inner and outer members telescopically engageable with one another and means forming a bore in said support adapted to receive said outer member, one of said members comprising a rack engageable with said drive gear and the other of said members being coupled to said press ram to reciprocate in response to reciprocation of the press ram, said outer member having a passageway extending between said inner member and said bore, a detent shiftable in said passageway and having a length greater than that of said passage, said bore and inner member each having a recess therein shaped cooperatively with said detent to receive a portion thereof and to shift said detent in said passageway from said inner member recess toward said bore recess when said inner and outer members are moved relative to one another and from said bore recess toward said inner member recess when said outer member is moved relative to said bore recess, said detent shifting only when said recess and said passageways are aligned with one another.

20. A lost motion coupling comprising a shaft having a shank portion and an enlarged portion with an external shoulder at the junction thereof and a recess in said shank portion, a sleeve having a small bore and a large bore for respectively slidably receiving said shank and said enlarged portions of said shaft, said sleeve further having an internal shoulder adapted to abut said external shoulder of said shaft to limit relative travel of said shaft and sleeve in a first direction, said sleeve also having an external shoulder and a radial passage, said radial passage being positioned to register with said shaft recess when said external shoulder of said shaft abuts said internal shoulder of said sleeve, an encircling supporting structure for said sleeve fixed against movement relative to said sleeve and shaft for slidably supporting said sleeve, said encircling structure having an internal shoulder adapted to abut said sleeve external shoulder to limit movement of the sleeve therein in a second direction opposite to the first direction of relative movement of said shaft and said sleeve, said encircling structure having a recess formed therein positioned for registry with said sleeve radial passage when said sleeve external shoulder and said encircling structure internal shoulder abut, and a ball received in said radial sleeve passage having a diameter greater than the depth of said recesses and greater than the radial length of said passage, said shaft recess being shaped to urge said ball into said encircling structure recess when said sleeve external shoulder abuts said encircling structure internal shoulder to thereby clear the ball from engagement with said shaft recess and couple said sleeve to said encircling structure and to permit relative movement of said shaft and said sleeve in the second direction, said encircling structure recess being shaped to urge said ball back into said shaft recess when said shaft external shoulder abuts said sleeve internal shoulder to thereby clear said ball from engagement with said encircling structure recess and couple said shaft to said sleeve to permit relative movement of said sleeve and said encircling structure in the first direction.

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