March 11, 1969 F. H. BAUTZ ET AL 3,432,042

TRANSFER ASSEMBLY FOR PRESSES

Filed Oct. 16, 1967 Sheet 1 of 5

Fig. 1.

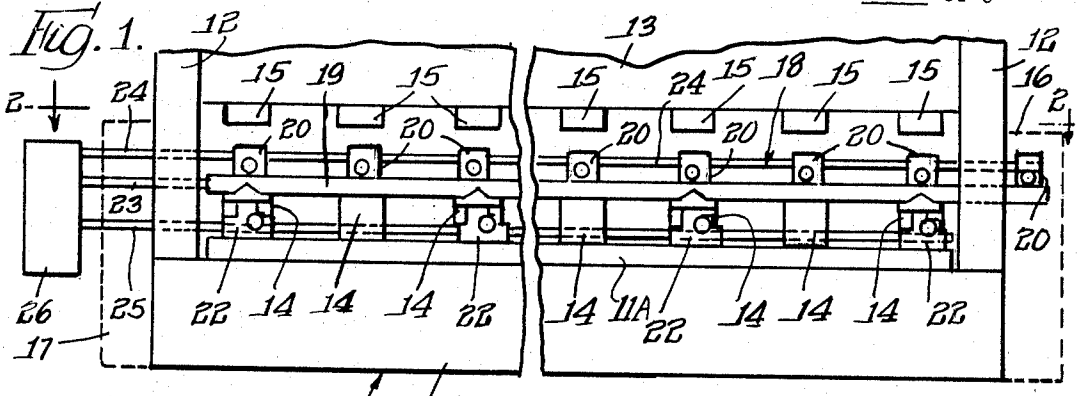


Fig. 2.

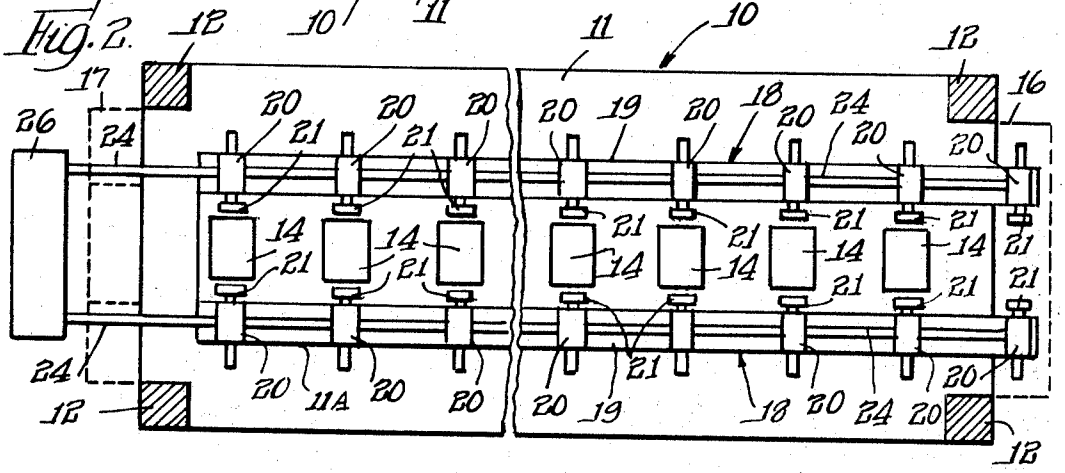
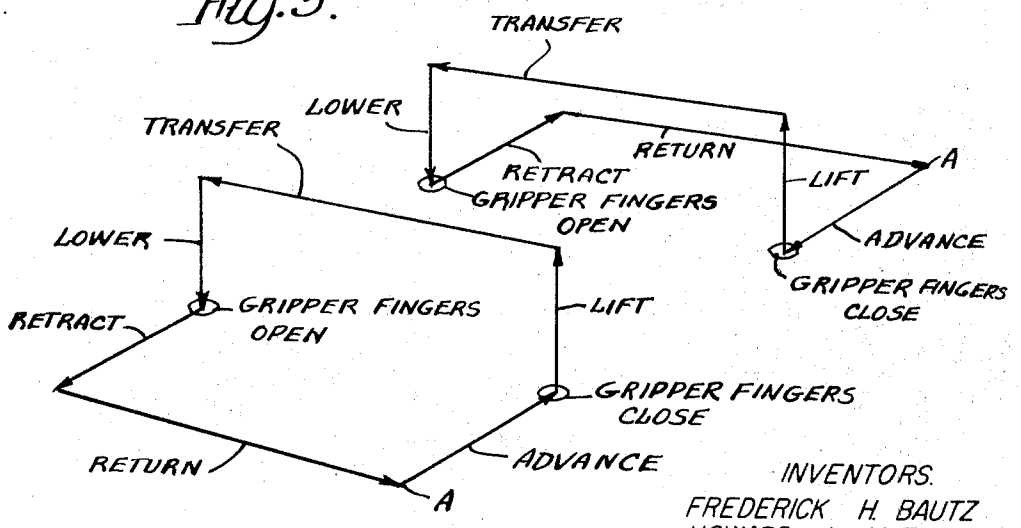


Fig. 3.



INVENTORS.
FREDERICK H. BAUTZ
HOWARD J. McELROY

BY Wallenstein, Spangenberg, Hattis & Strampel
Attys

March 11, 1969 F. H. BAUTZ ET AL 3,432,042

TRANSFER ASSEMBLY FOR PRESSES

Filed Oct. 16, 1967 Sheet 2 of 5

Fig. 4.

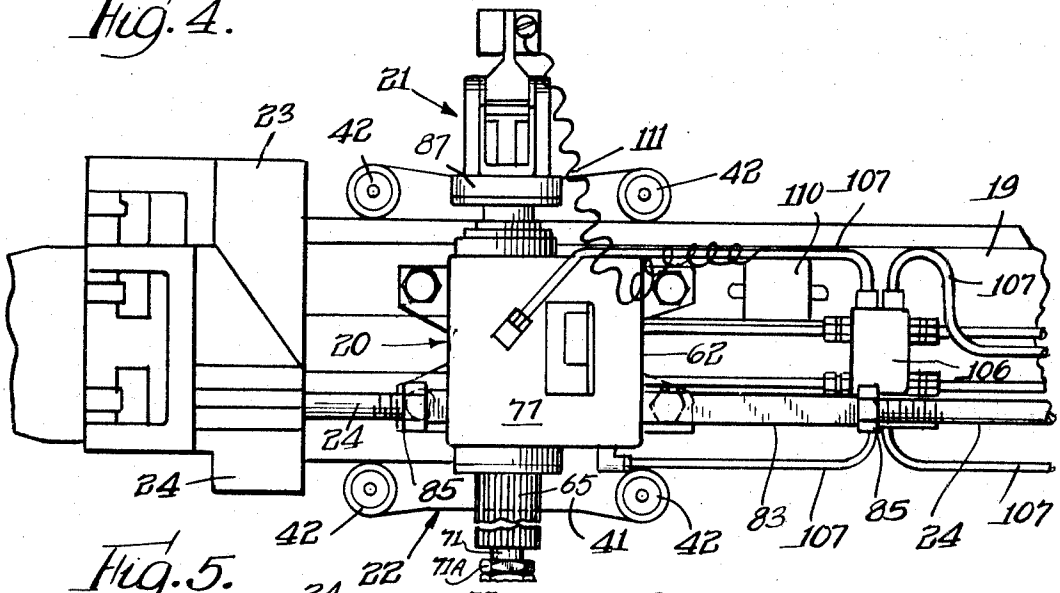
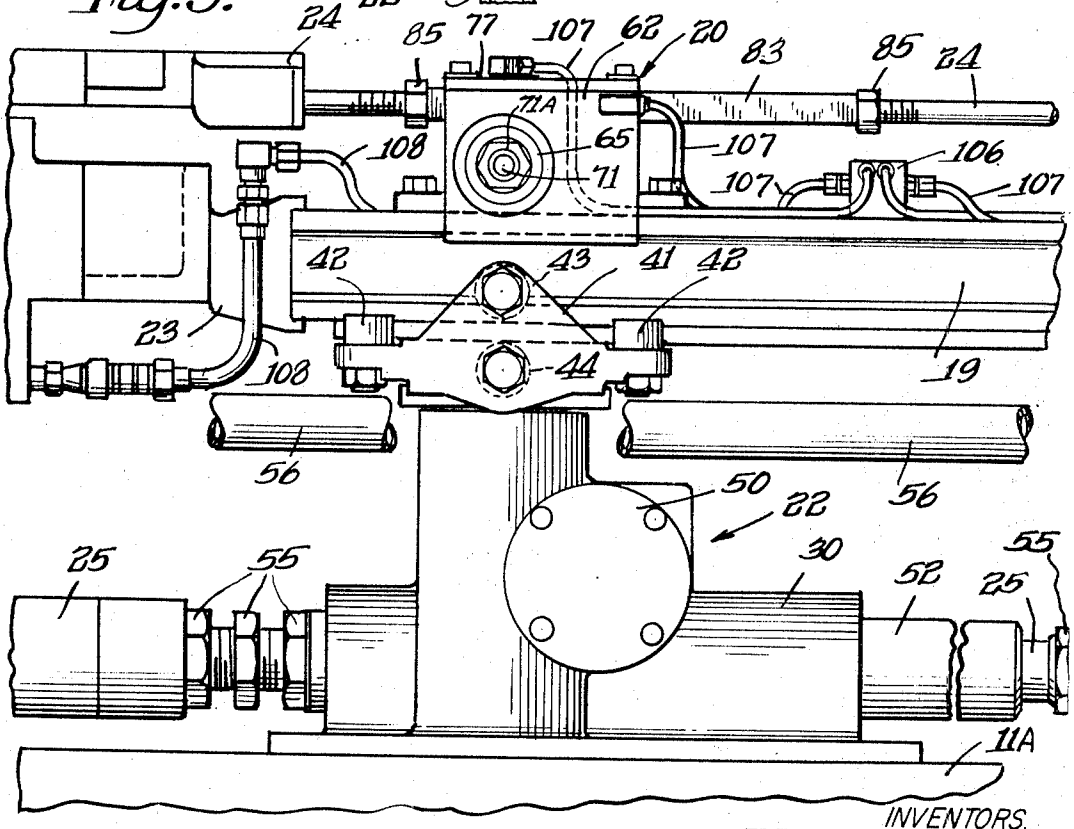


Fig. 5.



INVENTORS.
FREDERICK H. BAUTZ
HOWARD J. McELROY

BY Wallenstein, Spangenberg, Hattis & Strampel

ATTYS

March 11, 1969 F. H. BAUTZ ET AL 3,432,042

TRANSFER ASSEMBLY FOR PRESSES

Filed Oct. 16, 1967 Sheet 3 of 5

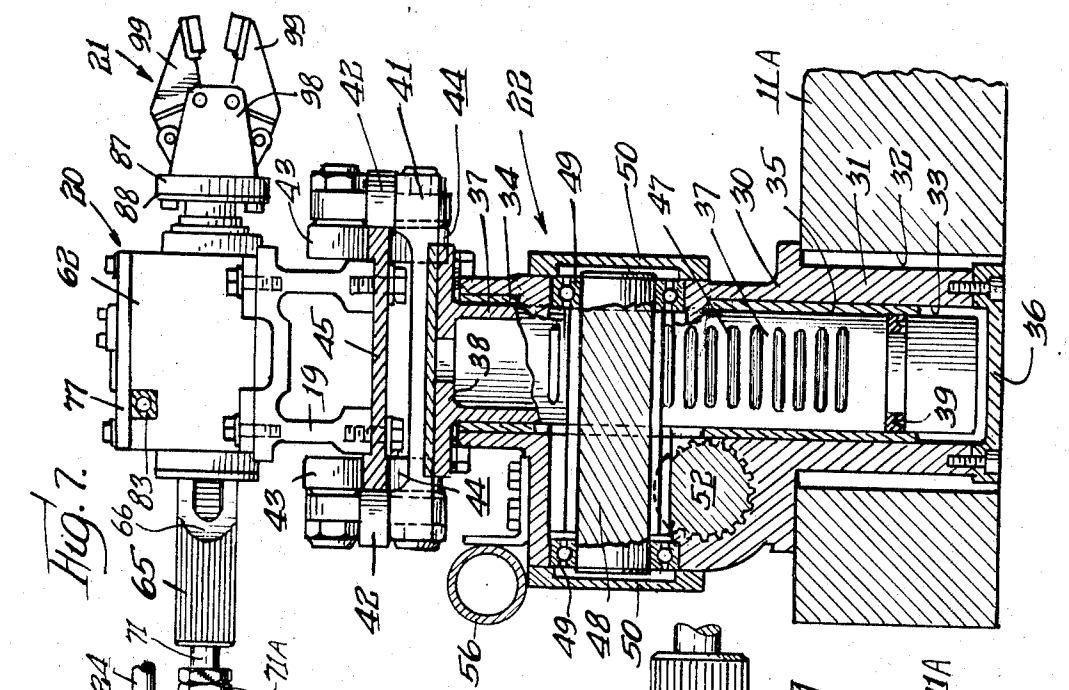


FIG. 7.

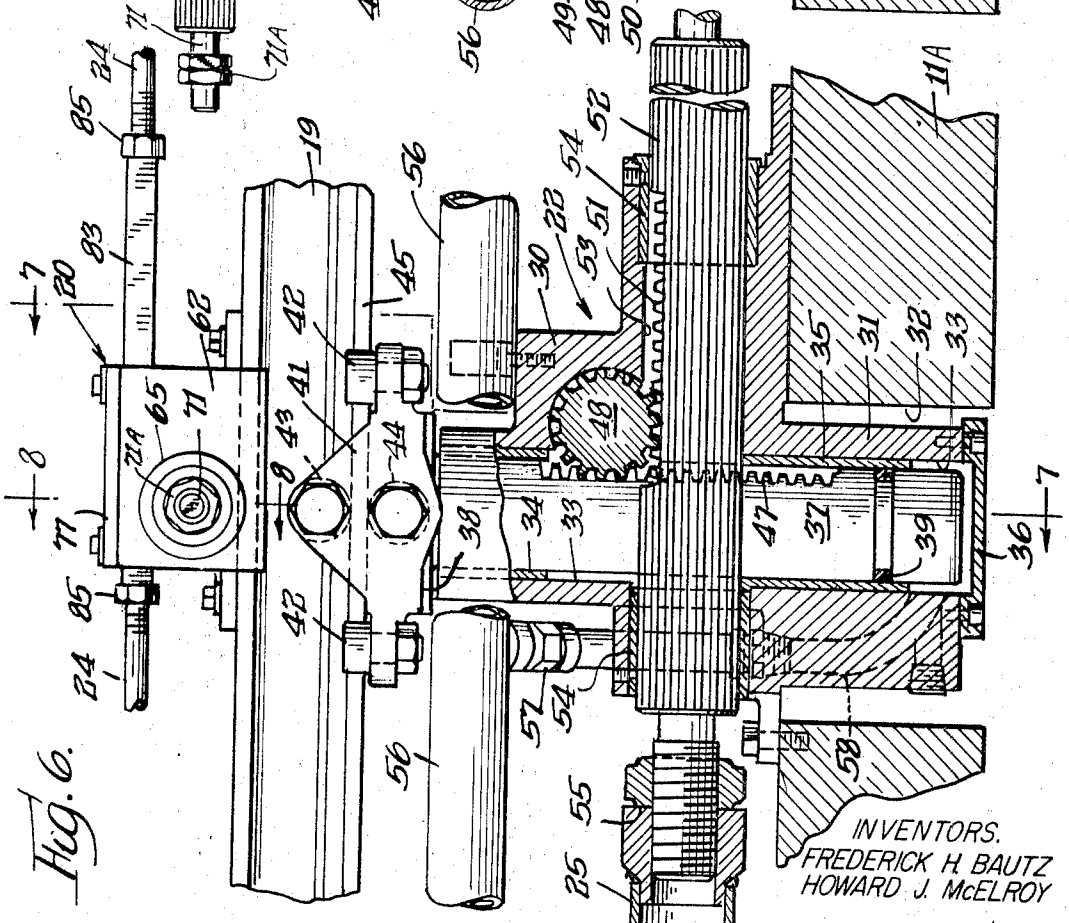


FIG. 6.

INVENTORS.
FREDERICK H. BAUTZ
HOWARD J. McELROY

BY Wallenstein, Spangenberg, Hattis & Strampel
ATTYS

March 11, 1969 F. H. BAUTZ ET AL 3,432,042

TRANSFER ASSEMBLY FOR PRESSES

Filed Oct. 16, 1967

Sheet 4 of 5

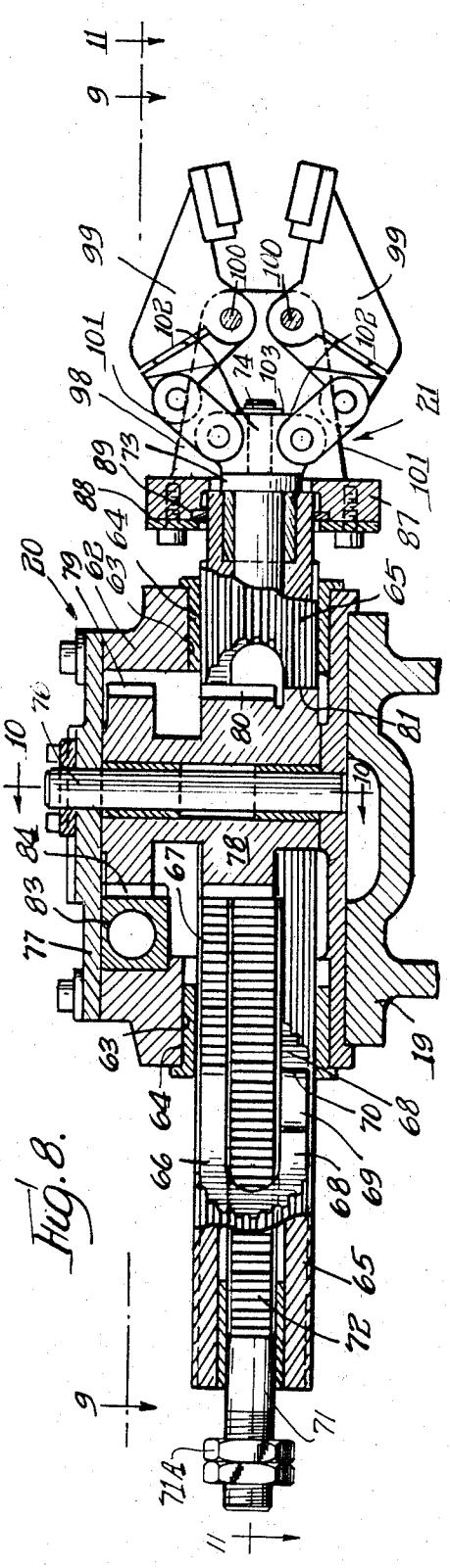


Fig. 8.

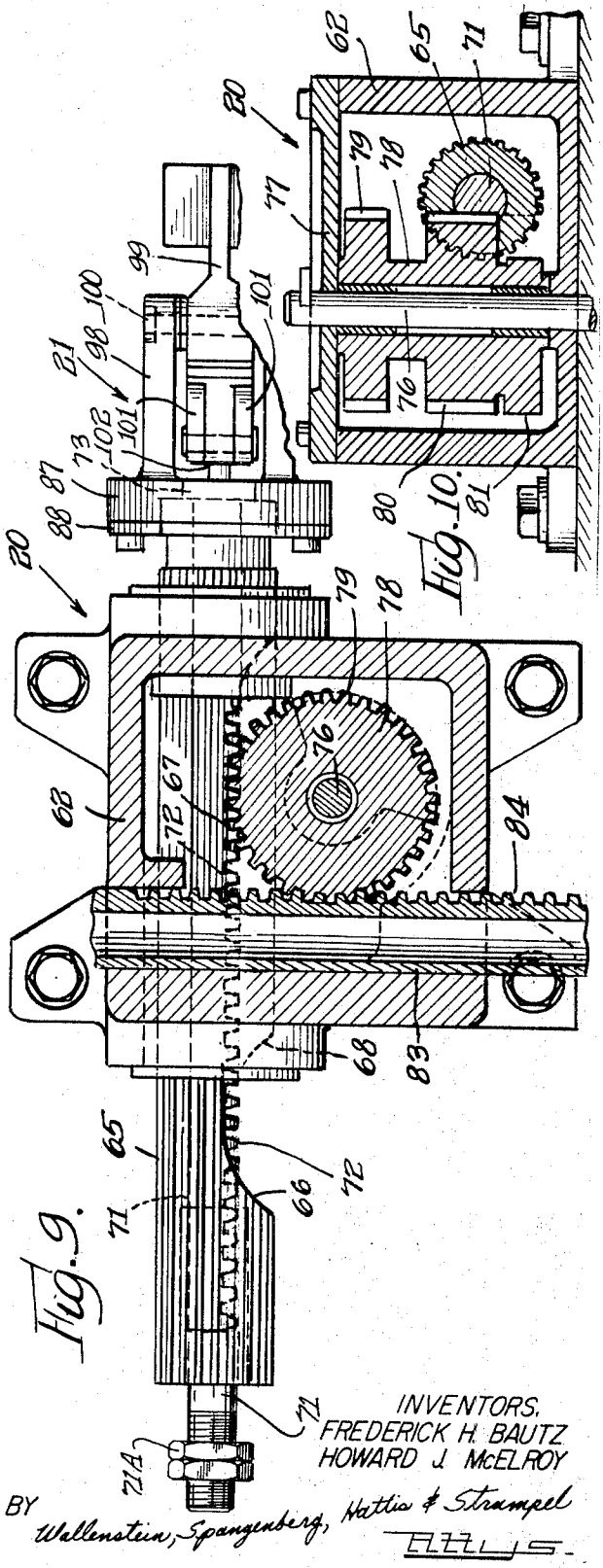


Fig. 9.

Fig. 10.

INVENTORS.
FREDERICK H. BAUTZ
HOWARD J. McELROY

BY Wallenstein, Spangenberg, Hattis & Strampel
ATTYS.

March 11, 1969 F. H. BAUTZ ET AL 3,432,042

TRANSFER ASSEMBLY FOR PRESSES

Filed Oct. 16, 1967 Sheet 5 of 5

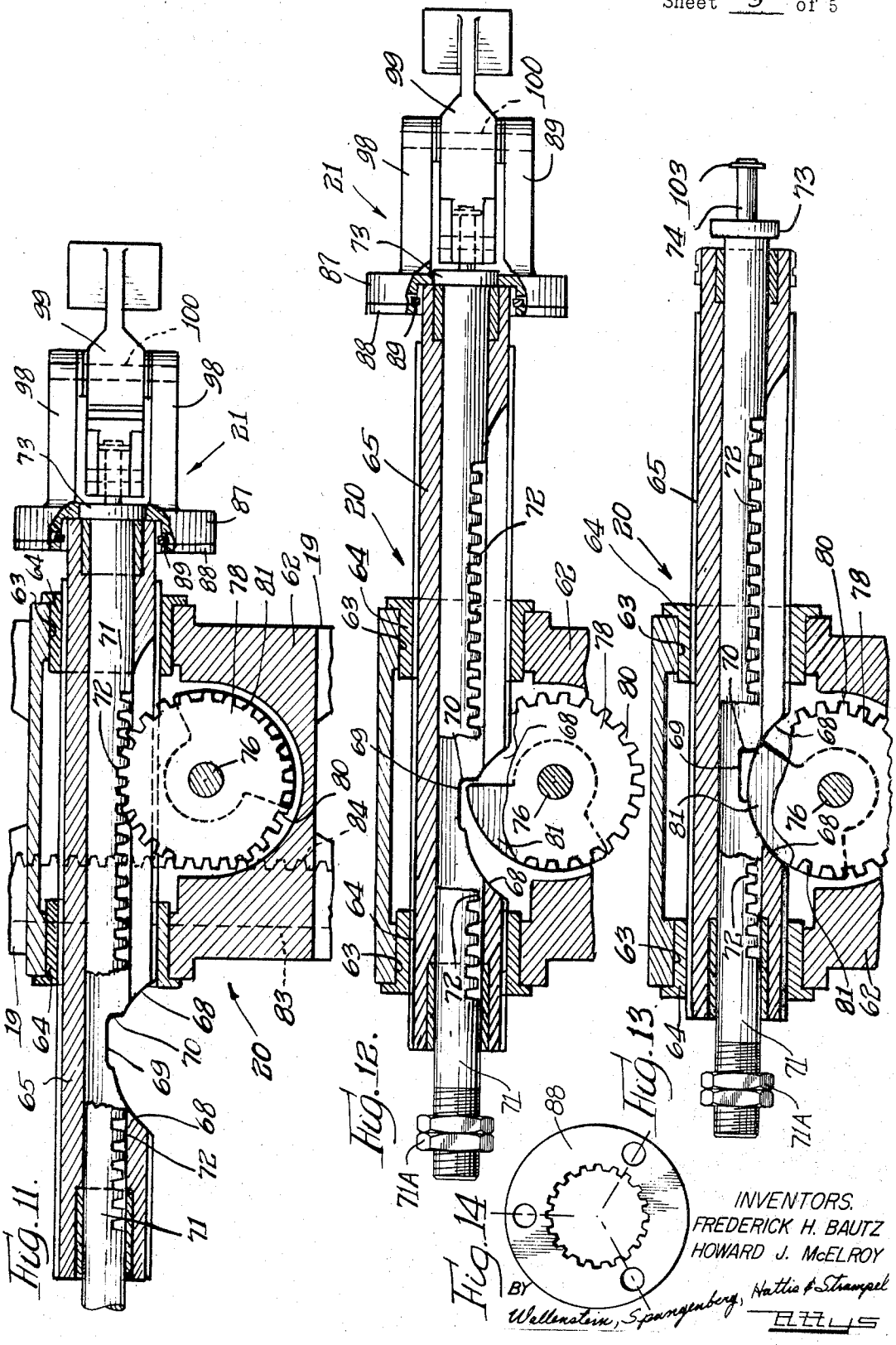


Fig. 11.

Fig. 12.

Fig. 13.

Fig. 14

INVENTORS.
FREDERICK H. BAUTZ
HOWARD J. McELROY

BY Wallenstein, Spangenberg, Hattis & Strampel
ATTYS

United States Patent Office 3,432,042
Patented Mar. 11, 1969

3,432,042

TRANSFER ASSEMBLY FOR PRESSES

Frederick H. Bautz, Hazel Crest, and Howard J. McElroy, South Holland, Ill., assignors to Verson Allsteel Press Company, Chicago, Ill., a corporation of Delaware

Filed Oct. 16, 1967, Ser. No. 675,625
U.S. Cl. 214—1 19 Claims
Int. Cl. B25j 3/00; B65g 61/00

ABSTRACT OF THE DISCLOSURE

A transfer assembly is provided for a press for gripping and transferring work pieces from station to station along the press. It includes at least one longitudinally movable feed bar and at least one gripper mechanism carried by said at last one feed bar for longitudinally moving gripper finger mechanisms having gripper fingers to grip and release the work pieces for transferring the work pieces as said at least one feed bar is longitudinally moved. The gripper mechanisms laterally advance and retract the gripper finger mechanisms and open and close the gripper fingers thereof. Said at least one feed bar is also raised and lowered by a lifter mechanism. In operation, the feed bars are in their lowered position, and the gripper finger mechanisms are then laterally advanced and the fingers are closed to grip the workpiece. The feed bars and gripper finger mechanisms are then raised, longitudinally moved in one direction and then lowered to transfer the workpiece from one station to the next. The gripper fingers are then opened and the gripper finger mechanisms are then laterally retracted and longitudinally returned in the opposite direction by the lowered feed bar for another cycle of operation. A single driving means including a longitudinally reciprocatable rod operates to advance and retract the gripper finger mechanism and also to close and open the gripper fingers thereof.

A principal object of this invention is to provide an improved gripper mechanism in the foregoing transfer assembly for laterally advancing and retracting the gripper finger assembly and closing and opening the gripper fingers thereof. Briefly, in this connection, the gripper mechanism includes a housing secured to the feed bar, and first and second actuator rods slidably carried by the housing for lengthwise movement transversely of the feed bar and extending from the housing. The first actuator rod carries the gripper finger mechanism for moving the same between advanced and retracted positions. The second actuator rod operates the gripper fingers of the gripper finger mechanism for closing and opening the gripper fingers as the second actuator rod is moved with respect to the first actuator rod, the gripper fingers normally being open.

Driving means drives the first and second actuator rods from the retracted position to the advanced position for advancing the gripper finger mechanism from the retracted position to the advanced position with the gripper fingers open, and also drives the second actuator rod to a projected position beyond the advanced position for closing the gripper fingers. Stop means prevents advance of the first actuator rod beyond the advanced position. The driving means also retracts the second actuator rod from the projected position to the advanced position for opening the gripper fingers, and further retracts the first and second actuator rods from the advanced position to the retracted position for retracting the gripper finger mechanisms. The driving means may include and be operated by a single longitudinally reciprocatable rod to perform the advancing and retracting and the closing and opening movements specified above. Such a gripper mechanism, the details of which are disclosed herein, is particularly

suitable for use in the transfer assembly disclosed herein, it being simple in construction and accurate in operation and it being rugged for long life operation.

Other objects of this invention reside in the combination of the transfer assembly incorporating the aforementioned gripper mechanism and including means for driving the gripper mechanisms, means for longitudinally moving the feed bars in one direction and the opposite direction, and lifter mechanisms for raising and lowering the feed bars all in timed relation.

The specific lifter mechanisms for raising and lowering the longitudinally movable fed bars are disclosed and claimed in Frederick H. Bautz application Ser. No. 675,543, filed Oct. 16, 1967.

The specific gripper finger mechanisms for gripping and releasing the work pieces are disclosed and claimed in Frederick H. Bautz and Tsuruo Otsuka application Ser. No. 675,544, filed Oct. 16, 1967.

Further objects and advantages of this invention will become apparent to those skilled in the art upon reference to the accompanying specification, claims and drawings in which:

FIG. 1 is a diagrammatic front elevational view of a conventional mechanical press having the transfer assembly of this invention applied thereto;

FIG. 2 is a diagrammatic horizontal sectional view through the press of FIG. 1 taken substantially along the line **2—2** of FIG. 1;

FIG. 3 is a chart illustrating the motions applied to the gripper finger mechanisms of the transfer assembly for transferring workpieces from one station to the next station in the press;

FIG. 4 is a top plan view of one portion of the transfer assembly diagrammatically illustrated in FIG. 2;

FIG. 5 is an elevational view of one portion of the transfer assembly illustrated in FIG. 1;

FIG. 6 is an elevational view of a portion of the transfer assembly illustrated in FIG. 5 with parts of the lifter mechanism shown in section;

FIG. 7 is an end elevational view of a portion of the transfer assembly looking from the right of FIG. 6 with the lifter mechanism thereof in section along the line **7—7** of FIG. 6;

FIG. 8 is a vertical sectional view through the gripper mechanism of a portion of the transfer assembly taken substantially along the line **8—8** of FIG. 6;

FIG. 9 is a horizontal sectional view through the gripper machanism taken substantially along the line **9—9** of FIG. 8;

FIG. 10 is a vertical sectional view through the gripper mechanism taken substantially along the line **10—10** of FIG. 8;

FIG. 11 is a horizontal sectional view through the gripper mechanism taken substantially along the line **11—11** of FIG. 9 and illustrating the actuator rods in the retracted position;

FIG. 12 is a horizontal sectional view similar to FIG. 11 but illustrating the actuator rods advanced to substantially the advanced position;

FIG. 13 is a horizontal sectional view similar to FIGS. 11 and 12 but illustrating the second actuator rod being advanced beyond the advanced position toward the projected position; and

FIG. 14 is an elevational view of a splined ring utilized in securing the gripper finger mechanism to the gripper mechanism.

Referring first to FIGS. 1 and 2, a conventional press, such as a mechanical press, is diagrammatically illustrated at **10**. It includes a bed **11**, uprights **12** supporting a crown (not shown) and a vertically reciprocatable ram **13** which may be driven from a power driven crank-

shaft (not shown). Arranged along the length of the bed **11** is a plurality of spaced apart work forming stations, each including a die structure **14** carried by an adapter plate **11A** and bolster on the bed **11** and a punch structure **15** including an adapter plate carried by the ram **13** for performing work functions on work pieces upon each downward stroke of the press ram **13** as they are progressively advanced along the press **10** from station to station. The initial work pieces are fed to the press **10** from a magazine **16** at one end of the press and the finished work pieces are discharged from the press **10** by a discharge mechanism **17**, such as a conveyor or a chute or the like, at the other end of the press **10**. The work pieces are progressively transferred from station to station in the press from the magazine **16** to the discharge mechanism **17**.

The press **10** is provided with a transfer assembly generally designated at **18** and extending lengthwise of the press. The transfer assembly **18** includes at least one longitudinally movable feed bar **19** (two being illustrated with one toward the front of the press and the other toward the rear of the press) which carry a plurality of equally spaced gripper mechanisms **20**. Each gripper mechanism **20** laterally advances and retracts a gripper finger mechanism **21** and opens and closes the gripper fingers of the gripper finger mechanism for gripping and releasing the work pieces being formed by the press. The transfer assembly **18** also includes a plurality of lifter mechanisms **22** carried by the adapter plate **11A** on the bed **11** for supporting and raising and lowering the longitudinally movable feed bars **19**.

A pair of longitudinally extending reciprocatable rods **23** is provided for longitudinally moving the feed bars **19** in one direction and in the opposite direction. A pair of longitudinally extending reciprocatable rods **24** is provided for operating the gripper mechanisms **20** to advance and retract the gripper finger mechanisms **21** and to open and close the gripper fingers thereof. A pair of longitudinally extending reciprocatable rods **25** is provided for operating the lifter mechanisms **22** to raise and lower the feed bars **19** and hence the gripper mechanisms **20** carried thereby. A suitable drive mechanism **26**, which is operated from the crankshaft of the press **10** in timed relation therewith, is arranged at one end of the press **10** for reciprocating the rods **23**, **24** and **25** in timed relation to each other and to the upward and downward movement of the press ram **13**.

The motions imparted to the gripper finger mechanisms **21** for transferring the work pieces from the magazine **16** and progressively from station to station along the press **10** to the discharge mechanism **17** are diagrammatically illustrated in FIG. 3. With the parts in the positions illustrated in FIGS. 1 and 2, the ram **13** has been raised sufficiently so that the punches **15** carried thereby are clear from the work pieces, the feed bars **19** are in their lowered and their returned positions, and the gripper finger mechanisms **21** are in their retracted positions with their fingers opened. This is represented by the point A in the diagram of FIG. 3.

First, the rods **24** are moved to the left with respect to the feed bars **19** to advance laterally the gripper finger mechanisms **20** and close the fingers thereof to grip the work piece in that station. Next, the rods **25** are moved to the left to raise the feed bars **19** and hence the gripper finger mechanisms **20** to lift the gripped work piece from the die structure of that station. Next, the rods **23** and **24** are simultaneously moved to the left to move the raised feed bars **19** to the left to transfer the gripped and raised work piece from that station to the next station, there being no relative movement between the rods **23** and **24** during this movement. Next, the rods **25** are moved in the opposite direction to the right to lower the feed bars **19** and hence the gripper finger mechanisms **20** for lowering the gripped work piece into the die structure **14** of said next station. Next, the rods **24** are moved in the opposite direction to the right to open the gripper fingers in the gripper mechanisms **20** and retract the gripper finger mechanisms. Next, the rods **23** and **24** are simultaneously moved in the opposite direction to the right to move the lowered feed bars **19** to the right to return the gripper finger mechanisms **21** with their fingers in opened position to point A in FIG. 3 for another transferring cycle. The punches **15** on the ram **13** perform their work functions on the work pieces while the gripper finger mechanisms **20** are lowered and retracted. The drive mechanism **26** may include suitable cam, linkage and lever constructions operated from the crankshaft of the press **10** for producing the foregoing timed sequences of operation of the rods **23**, **24** and **25** with respect to the operation of the press ram **13**.

While the transfer assembly **18** is illustrated in FIGS. 1 to 3 as having two sets of mechanisms, one toward the front of the press and the other toward the rear, for gripping the work pieces at two points for transferring them along the press, in some instances it may be desirable to grip the work pieces at only one point for this purpose and, under such circumstances, only one set of mechanisms need be used, as for example, the one toward the front of the press or the one toward the rear thereof. The constructions of the lifter mechanism **22** and the gripper mechanisms **20** are generally illustrated in FIGS. 4 to 7, the details of the lifter mechanisms **22** being illustrated in FIGS. 6 and 7 and the details of the gripper mechanisms being illustrated in FIGS. 8 to 13.

Referring now to FIGS. 4 to 7 the lifter mechanism, generally designated at **22**, includes a lifter housing **30** which is suitably secured to the top of the adapter plate **11A** on the bed structure **11**. It has a downwardly extending projection **31** which is accommodated by an opening **32** in the adapter plate **11A**. The adapter plate **11A** in addition to carrying the lifter housing **30** also carries the die structures **14** so that the transfer assembly **18** and the die structures **14** are a unitized assembly which may be removed and replaced as a unit, the adapter plate being removable from the bolster and the bed **11** for this purpose. The housing **31** has a vertically arranged cylindrical opening **33** therethrough and a bearing sleeve **34** is arranged at the top of the opening and a bearing sleeve **35** is arranged toward the bottom of the opening but spaced upwardly therefrom. The opening **33** is closed at its bottom by a plate **36** suitably secured to the downward extension **31** of the housing **30**. A plunger **37** is vertically slidably mounted by the bearing sleeves **34** and **35** in the opening **33** and it is provided at its upper extremity with a flange **38**. Adjacent its lower end the plunger **37** is provided with a seal **39** for sealing the plunger with respect to the bearing sleeve **35**.

A bracket **41** is secured to the flange **38** at the upper end of the plunger **37** and this bracket **41** carries four rollers **42** rotatable about vertical axes, two rollers **43** rotatable about horizontal axes and two rollers **44** rotatable about horizontal axes. These rollers cooperate with a track **45** secured to the underside of the longitudinally movable feed bars **19**. The track **45** extends laterally from the feed bars **19** so as to be laterally engaged by the rollers **42** and vertically engaged by the rollers **43** and **44**. As a result, the track **45** and, hence, the feed bars **19** are supported and guided for longitudinal movement by the rollers **42**, **43** and **44** carried by the upper end of the plunger **37**.

The vertically movable plunger **37** is provided on one side with a toothed rack **47** which is engaged by an elongated gear **48**, substantially one half of the gear **48** being a driven gear meshing with the toothed rack **47** on the plunger **37**. The other half of the gear **48** forms a driving gear. The gear **48** is journaled in suitable bearings **49** carried by the housing **30** and they and the gear **48** are enclosed by plates **50** suitably secured in place. Rack teeth **51** on a longitudinally movable rack **52** mesh with the driving gear portion of the gear **48**. The exterior of

the rack 52 is splined to engage internal splines on spline bearings 54 suitably secured in a longitudinally extending opening 53 in the housing 30 to prevent rotation of the rack. The splined rack 52 is secured by suitable adjustable couplings 55 to the longitudinally movable rod 25. Where two feed bars 19 are used, a longitudinally movable rod 25 is provided for each row of lifter mechanisms. Both rods 25 are driven from a common cam drive and are thus actuated simultaneously.

With the parts of the lifter mechanism in the position illustrated in FIGS. 4 to 7, the plunger 37 is in its lowered position and, hence, the feed bar 19 is in its lowered position. When the rack 52 is moved to the left by the longitudinally reciprocatable rod 25, the driving portion of the gear 48 is rotated in a clockwise direction as illustrated in FIG. 6 to cause the driven portions of the gear 48 to raise the plunger 37 and, hence, the feed bar 19 supported by the supporting and guide rollers 42, 43 and 44 carried by the bracket 41 which is secured to the upper end of the plunger 37. When the rack 52 is moved in the opposite direction to the right by the longitudinally reciprocatable rod 25, the gear 48 is rotated in the counterclockwise direction to lower the plunger 37 and, hence, the feed bar 19. Thus, by longitudinally reciprocating the rack 52 in one direction and the opposite direction the feed bar 19 is raised and lowered, the longitndinal reciprocation of the rack 52 being accomplished by the longitudinal reciprocation of the rod 25.

A manifold 56, to which compressed air is suitably supplied, extends along the length of the press adjacent the various lifter mechanisms 22 and suitable connections 57 are made from this manifold 56 to a passage 58 in the downwardly extending portion 31 of the lifter housing 30 for supplying compressed air below the sleeve 31 under the plunger 37. This compressed air normally exerts an upward force on the plunger 37 for supporting much of the load of the feed bar 19 and the mechanisms carried thereby. As a result, minimum stress is applied to the rack 52, the gear 48 and the toothed rack 47 of the plunger 37 and ready raising and lowering of the feed bar 19 and the mechanisms carried thereby is provided with minimum force applied to the longitudinally reciprocatable rod 25. By adjusting the adjustable connections 55, the positions of the rack 52 and, hence, the plunger 37 may be adjusted with respect to the position of the longitudinally reciprocatable rod 25. The stroke length of the reciprocatable rod 25 may be infinitely adjustable within a predetermined range so that the amount of lift motion may be varied to suit requirements of the parts to be produced. The number of lifter mechanisms may be selected to suit the length of the feed bars 19 and the rack 52 thereof may be connected together by the threaded coupling 55.

The gripper mechanism generally designated at 20 in FIGS. 4 to 13 includes a gripper mechanism housing 62. This housing 62, as illustrated in FIGS. 8 to 13, includes a transversely extending opening 63 in which internally splined bearing members 64 are mounted. Slidably mounted in these bearing members 64 is an externally splined hollow first actuator rod 65, the splines permitting longitudinal sliding movement of the first actuator rod 65 but preventing rotation thereof. A side of the hollow first actuator rod 65 is milled out as indicated at 66 and one side of this milled portion 66 of the hollow actuator rod 65 is provided with rack teeth 67. The other side of said side of the hollow actuator rod 65, which is also milled out as indicated at 68, provides a circular cam slot which in turn is provided with a recess 69 and a shoulder 70 in the form of a modified involute. A second actuator rod 71 is longitudinally slidable in the hollow first actuator rod 65 and it is provided with rack teeth 72 which extend to a greater length to the left than the rack teeth 67 in the first actuator rod 65. The end of the second actuator rod 71 has an annular shoulder 73 which is adapted to engage the corresponding end of the first actuator rod 65 when said actuator rods are in their retracted and advanced positions. The second actuator rod 71 is provided with an extension 74 beyond the shoulder 73 for operating the fingers of the gripper finger asssembly 21.

A vertically arranged pin 76 is supported in the gripper mechanism housing 62 by the bottom wall thereof and by a cover 77 suitably secured in place on the housing 62, a key holding the pin from longitudinal and rotative movement. A combination gear and cam member 78 is rotatably mounted on the pin 76 by suitable bearings. The combination gear and cam member 78 has a driving gear 79, a driven gear 80 and a cam 81. A rack 83 is longitudinally slidably mounted in the housing 62 and it is provided with rack teeth 84 which mesh with the driving gear teeth 79. The rack 83 is longitudinally provided with the hole for receiving the longitudinally reciprocatable rod 24 and is adjustably connected along the rod 24 by nuts 85 threaded on the rod 24. Thus, as the rod 24 is reciprocated, the rack 83 drives the driving gear 79. The rack 83 is adjustably mounted on the rod 24 so that each gripper mechanism may be adjusted and set independently of all others. Thus, adjustment of one gripper mechanism will not affect the setting of others.

With the parts in the position illustrated in FIGS. 4 to 11, the longitudinally reciprocatable rod 24 and rack 83 are in the right hand position and the first actuator rod 65 and the second actuator rod 71 are in the retracted position. As the longitudinally reciprocatable rod 24 is moved to the left, the driving gear 79 is rotated by the rack 83 to rotate the driven gear 80 and the cam 81. This rotation of the driven gear 80 which meshes with the racks 67 and 72 on the actuator rods 65 and 71 laterally advances these actuator rods from their retracted positions as illustrated in FIG. 11 to substantially their advanced positions as illustrated in FIG. 12. When the actuator rods 65 and 71 are so moved to substantially their advanced positions as illustrated in FIG. 12, the rack teeth 67 on the first actuator rod 65 disengaging the driven gear teeth 80 so that the first actuator rod 65 cannot be advanced any further thereby. At this point the leading edge of the cam 81 having a modified involute form engages the shoulder 70 of modified involute form in the recess 69 of the cam slot 68 in the first actuator rod 65 to provide a slight amount of additional forward motion to the first actuator rod 65. When, however, the leading edge of the cam 81 disengages the shoulder 70 as illustrated in FIG. 13, the cam 81 is engaged by the circular cam slot 68 in the actuator rod 65 and, hence, further advance of the first actuator rod 65 is stopped, the cam 81 cooperating with the circular cam slot 68 to lock the first actuator rod 65 in the advanced position. As the combination cam and gear member 78 is further rotated, the driven gear 80 which is still in mesh with the rack teeth 72 on the second actuator rod 71, causes continued advance of the second actuator rod 71 toward a projected position. Such continued advancing movement of the second actuator rod 71 beyond the advanced positioned to the projected position operates to cause the fingers of the gripper finger mechanism 21 to close as will be explained more fully hereafter.

When the longitudinally reciprocatable rod 24 is moved in the opposite direction to the right, the combination gear and cam member 78 is rotated in the opposite direction to retract the second actuator rod 71 from its projected position to its advanced position. When the second actuator rod is thus retracted to its advanced position, the leading edge of the cam 81 is returned beyond the shoulder 70 in the slot 69 in the first actuator rod 65 and the shoulder 73 on the first actuator rod 71 engages the end of the first actuator rod 62. This causes the first actuator rod 65 to be retracted somewhat from its advanced position so that the rack teeth 67 thereof are re-engaged by the driven gear 80 to positively drive the first actuator rod 65 and also the second actuator rod 71 from their advanced positions to their retracted positions as illustrated

in FIG. 11. When the first actuator rod 65 is being initially retracted, the modified involute leading edge of the cam 81 and the modified involute shoulder 70 on the rod 65 engage to insure proper re-engagement of the rack teeth 67 with the teeth of the driven gear 80. Thus, upon movement of the longitudinally reciprocatable rod 24 to the left, the first and second actuator rods 65 and 71 are driven to their advanced position from their retracted position, the first actuator rod 65 is stopped or locked in its advanced position and the second actuator rod 71 is advanced beyond the advanced position to the projected position. Upon movement of the longitudinally reciprocatable rod 24 in the opposite direction to the right the second actuator rod 71 is retracted from its projected position to its advanced position, the stopping or locking means for the second actuator rod 71 is released and both the first actuator rod 65 and the second actuator rod 71 are retracted from their advanced position to their retracted position.

The gripper finger mechanism generally designated at 21 in FIGS. 7, 8, 9, 11 and 12 includes a bracket 87 which fits over the splined end of the first actuator rod 65. Adjacent its end, the first actuator rod 65 is provided with a first groove for receiving a snap ring 89 and a second wider groove for rotatably receiving an internally splined ring 88 (FIG. 14). The ring 88 is drawn against the snap ring by three equally radially spaced screws threaded into the bracket 87 to clamp the bracket 87 in place, and when this occurs the internal splines in the ring 88 engage the external splines on the first actuator rod 65 between the grooves therein to lock the bracket 87 against rotation. There are 20 splines on the rod 65 and in the ring 88 and since three equally spaced screws are utilized (FIG. 14), the bracket 87 may be clamped in 60 different desired rotative positions on the rod 65. The bracket 87 has a pair of spaced ears 98 and a pair of gripper fingers 99 are arranged between and pivoted to the ears 98 by pivots 100. The pivoted gripper fingers 99 are connected by links 101 to a bracket 102 carried by the projection 74 on the second actuator rod 71, the bracket 102 being secured in place on the projection 74 by a snap ring 103.

When both of the actuator rods 65 and 71 are in their retracted positions and in their advanced positions with the shoulder 73 on the second actuator rod 71 engaging the first actuator rod 65, the gripper fingers 99 are opened as illustrated. However, when the first and second actuator rods 65 and 71 are advanced to their advanced position and the second actuator rod 71 is advanced beyond the advanced position to the projected position, the bracket 102 is moved outwardly to cause the links 101 to close the gripper fingers 99. When the second actuator rod 71 is retracted from the projected position to the advanced position where the shoulder 73 on the second actuator rod 71 engages the end of the first actuator rod 65, the bracket 102 on the second actuator rod 71 is retracted to cause the links 101 to open the gripper fingers 99. To aid in adjusting the gripper finger mechanisms in their work gripping positions, the opposite ends of the second actuator rods 71 are threaded and provided with nuts 71A. In setting up the transfer assembly, the longitudinally reciprocatable rod 24 is moved to the left to advance the gripper finger mechanisms 21 and close the gripper fingers thereof and one of the nuts 85 on the rod 24 adjacent each gripper mechanism 20 is backed off to allow desired setting of the fingers in their closed positions. The nuts 71A are then drawn up against the end of the first actuator rod 65 and locked in place to fix the set positions of the closed fingers for the particular work pieces gripped thereby. Then the nuts 85 on the rod 24 are drawn up against the racks 83. In this way the closed positions of the gripper fingers may be individually accurately set. Also by utilizing the nuts 71A the set position is always assured even though it may be necessary to back off the nuts 85 to release a faulty work piece from between the fingers should this occur and be required.

Referring to FIGS. 4 and 5, the feed bars 19 carry a plurality of lubricating fittings 106 for supplying lubricant through connection 107 to the moving parts of the gripper mechanisms 20, suitable lubricant being supplied to the lubricating fittings 106 from a lubricant supply line 108. The feed bars 19 also carry terminal boxes 110 having leads 111 extending to the gripper fingers for providing an electrical signal to indicate that the work pieces are properly gripped by the gripper fingers of the gripper assembly. In the event that the work pieces are not properly gripped the signal operates to shut down the press.

While for purposes of illustration one form of this invention has been disclosed, other forms thereof may become apparent to those skilled in the art upon reference to this disclosure and, therefore, this invention is to be limited only by the scope of the appended claims.

We claim:

1. In a transfer assembly for a press for gripping and transferring workpieces from station to station along the press and including at least one longitudinally movable feed bar and at least one gripper mechanism carried by said at least one feed bar for longitudinally moving gripper finger mechanisms having gripper fingers to grip and release the workpieces for transferring the workpieces as said at least one feed bar is longitudinally moved, the improvement wherein each said gripper mechanism includes a housing secured to the feed bar, first and second actuator rods slidably carried by the housing for lengthwise movement transversely of the feed bar and extending from said housing, said first actuator rod carrying the gripper finger mechanism for moving the same between advanced and retracted positions, said second actuator rod operating the gripper fingers of the gripper finger mechanism for closing and opening the gripper fingers as the second actuator rod is moved with respect to the first actuator rod, said gripper fingers normally being open, driving means for driving said first and second actuator rods from the retracted position to the advanced position for advancing the gripper finger mechanism from the retracted position to the advanced position with its gripper fingers open and for driving said second actuator rod to a projected position beyond said advanced position for closing the gripper fingers, and stop means for preventing advance of said first actuator rod beyond said advanced position, said driving means also retracting said second actuator rod from the projected position to the advanced position for opening the gripper fingers and retracting said first and second actuator rods from the advanced position to the retracted position for retracting the gripper finger mechanism.

2. The combination of claim 1 wherein said driving means includes a driven gear in said housing and rotatable in opposite directions, and means associated with said actuator rods and including rack means engageable with said driven gear.

3. The combination of claim 1 wherein said driving means includes a driven gear in said housing and rotatable in opposite directions, a rack on said first actuator rod which is engageable with said driven gear only when said first actuator rod is between said retracted and advanced positions, and a rack on said second actuator rod which is longer than said rack on said first actuator rod and which is engageable with said driven gear when said second actuator rod is between said retracted and said projected position.

4. The combination of claim 3 wherein said stop means includes a cam slot in said first actuator rod, and a cam associated with said driven gear and engageable with said cam slot when said first actuator rod is advanced to said advanced position for locking the same in said advanced position.

5. The combination of claim 1 wherein said driving means includes at least one longitudinally reciprocatable

rod extending lengthwise of said at least one feed bar into the housing.

6. The combination of claim 2 wherein said driving means includes a driving gear in the housing associated with the driven gear for driving the same, at least one longitudinally reciprocatable rod extending lengthwise of said at least one feed bar into the housing and a rack on said at least one longitudinally reciprocatable rod engageable with said driving gear for driving the same.

7. The combination of claim 3 wherein said driving means includes a driving gear in the housing associated with the driven gear for driving the same, at least one longitudinally reciprocatable rod extending lengthwise of said at least one feed bar into the housing and a rack on said at least one longitudinally reciprocatable rod engageable with said driving gear for driving the same.

8. The combination of claim 1 including means for longitudinally moving said at least one feed bar in one direction when said at least one gripper finger mechanism is transversely advanced to its advanced position and its gripping fingers closed and for longitudinally moving said at least one feed bar in the opposite direction when said at least one gripper finger mechanism is transversely retracted to its retracted position with its gripping fingers opened.

9. The combination of claim 5 including means for longitudinally moving said at least one feed bar in one direction when said at least one gripper finger mechanism is transversely advanced to its advanced position and its gripping fingers closed and for longitudinally moving said at least one feed bar in the opposite direction when said at least one gripper finger mechanism is transversely retracted to its retracted position with its gripping fingers opened, said means for longitudinally moving said at least one feed bar being operative only when said driving means is stationary and said driving means being operative only when said means for longitudinally moving said at least one feed bar is stationary.

10. The combination of claim 8 including means for raising said at least one feed bar before said at least one feed bar is moved in said one direction and for lowering said at least one feed bar before said at least one feed bar is moved in said opposite direction.

11. The combination of claim 9 including means for raising said at least one feed bar before said at least one feed bar is moved in said one direction and for lowering said at least one feed bar before said at least one feed bar is moved in said opposite direction.

12. The combination of claim 2 including means for longitudinally moving said at least one feed bar in one direction when said at least one gripper finger mechanism is transversely advanced to its advanced position and its gripping fingers closed and for longitudinally moving said at least one feed bar in the opposite direction when said at least one gripper finger mechanism is transversely retracted to its retracted position with its gripping fingers opened.

13. The combination of claim 6 including means for longitudinally moving said at least one feed bar in one direction when said at least one gripper finger mechanism is transversely advanced to its advanced position and its gripping fingers closed and for longitudinally moving said at least one feed bar in the opposite direction when said at least one gripper finger mechanism is transversely retracted to its retracted position with its gripping fingers opened, said means for longitudinally moving said at least one feed bar being operative only when said driving means is stationary and said driving means being operative only when said means for longitudinally moving said at least one feed bar is stationary.

14. The combination of claim 12 including means for raising said at least one feed bar before said at least one feed bar is moved in said one direction and for lowering said at least one feed bar before said at least one feed bar is moved in said opposite direction.

15. The combination of claim 13 including means for raising said at least one feed bar before said at least one feed bar is moved in said one direction and for lowering said at least one feed bar before said at least one feed bar is moved in said opposite direction.

16. The combination of claim 3 including means for longitudinally moving said at least one feed bar in one direction when said at least one gripper finger mechanism is transversely advanced to its advanced position and its gripping fingers closed and for longitudinally moving said at least one feed bar in the opposite direction when said at least one gripper finger mechanism is transversely retracted to its retracted position with its gripping fingers opened.

17. The combination of claim 7 including means for longitudinally moving said at least one feed bar in one direction when said at least one gripper finger mechanism is transversely advanced to its advanced position and its gripping fingers closed and for longitudinally moving said at least one feed bar in the opposite direction when said at least one gripper finger mechanism is transversely retracted to its retracted position with its gripping fingers opened, said means for longitudinally moving said at least one feed bar being operative only when said driving means is stationary and said driving means being operative only when said means for longitudinally moving said at least one feed bar is stationary.

18. The combination of claim 16 including means for raising said at least one feed bar before said at least one feed bar is moved in said one direction and for lowering said at least one feed bar before said at least one feed bar is moved in said opposite direction.

19. The combination of claim 17 including means for raising said at least one feed bar before said at least one feed bar is moved in said one direction and for lowering said at least one feed bar before said at least one feed bar is moved in said opposite direction.

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GERALD M. FORLENZA, *Primary Examiner.*

G. F. ABRAHAM, *Assistant Examiner.*

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294—115