United States Patent [19]

Storch

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[54] **TRANSFER MECHANISM**

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[52] **U.S. Cl.** ..... **214/1 BB,** 198/218

[51] **Int. Cl.** **B65g 25/04**

[58] **Field of Search** ..... 214/1 BB; 198/218, 198/219

[56] **References Cited**

UNITED STATES PATENTS

1,775,121	9/1930	Einfeldt	198/219
1,811,339	6/1931	Debije	198/219
3,011,464	12/1961	Danly	214/1 BB
3,655,070	4/1972	Haydu	214/1 BB

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Assistant Examiner—George F. Abraham
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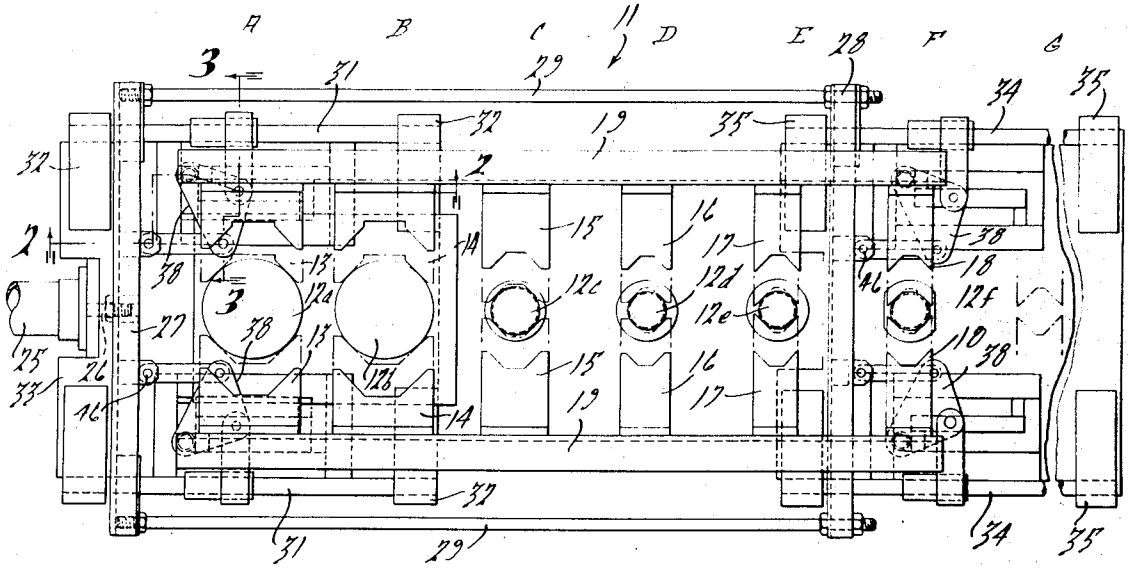
[57] **ABSTRACT**

A mechanism for transferring workpieces along a succession of equidistantly spaced work stations. The mechanism comprises a plurality of workpiece-engaging members carried by one or more bars, together with actuating means for moving the bars in a rectangular path to engage, transfer, and disengage the workpieces, and retract to their original positions. The actuating means comprises a reciprocable actuator which may be linked with the motion of a press, link and bell crank means connecting the actuator to the bars, and cam and cam follower means connected to the bell crank to create rectilinear motion of the work-engaging bars in response to the reciprocating motion of the actuator.

10 Claims, 10 Drawing Figures



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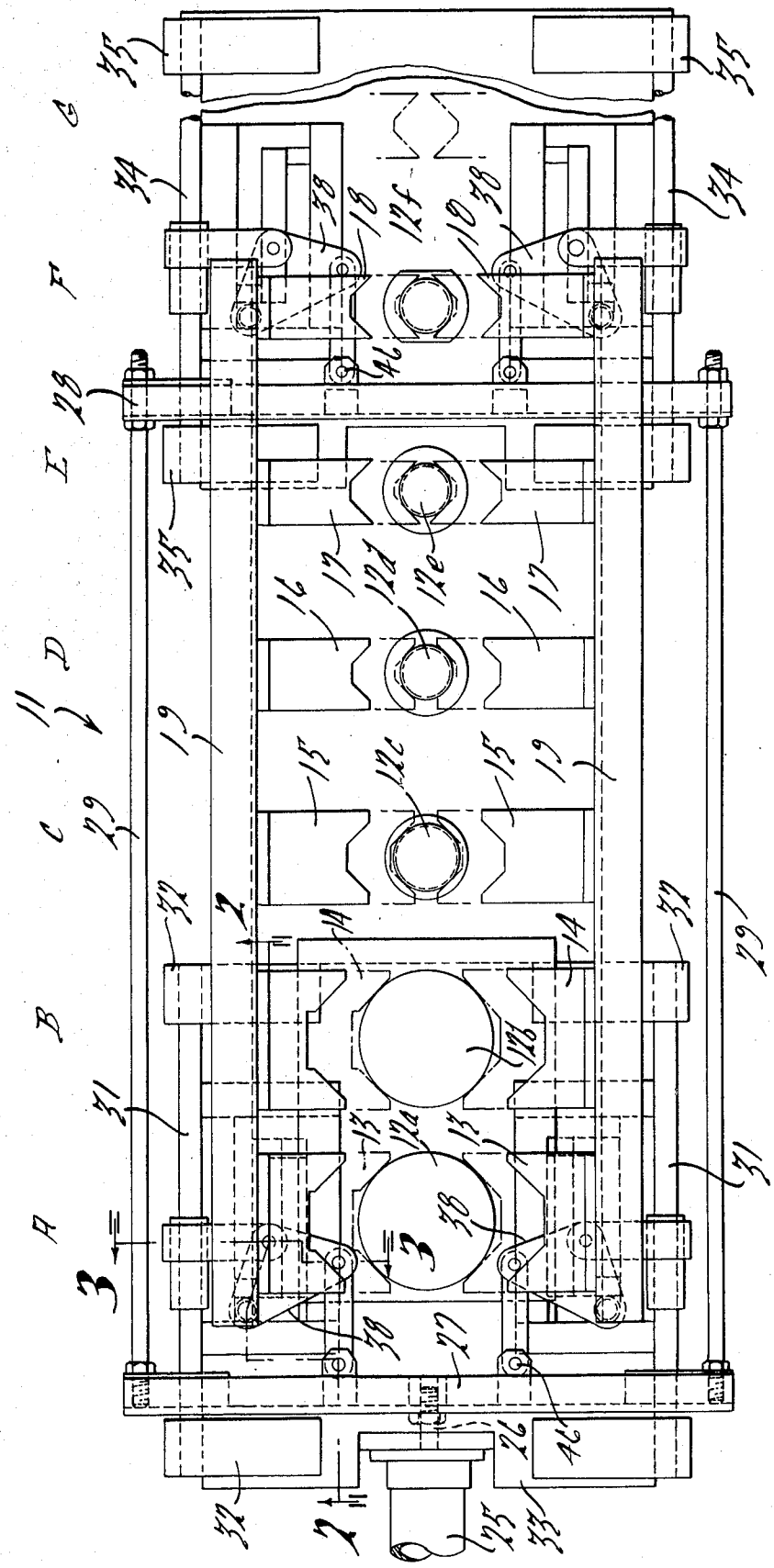

Fig. 1.

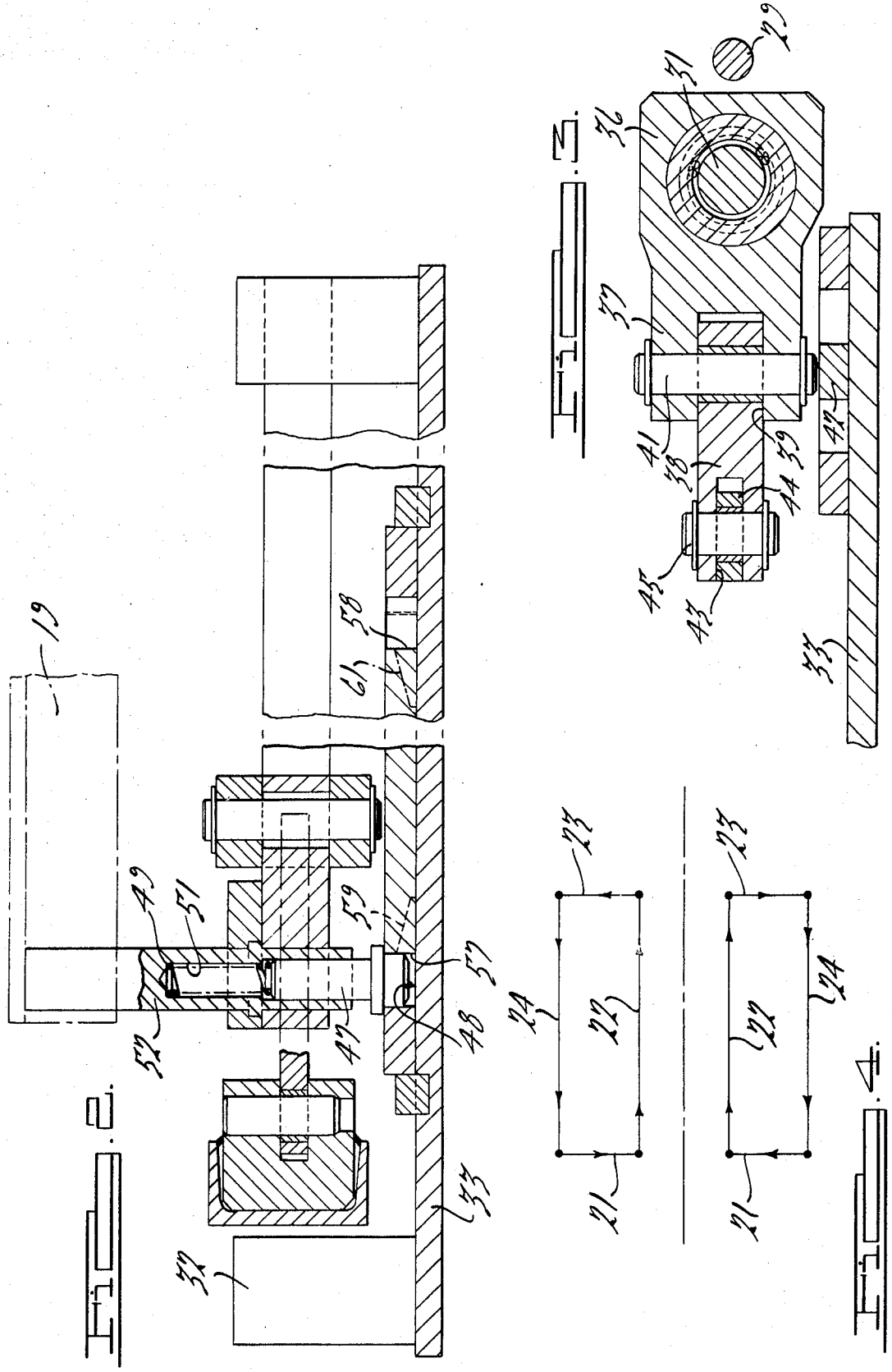
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Fig. 2.
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Fig. 3.
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Fig. 4.

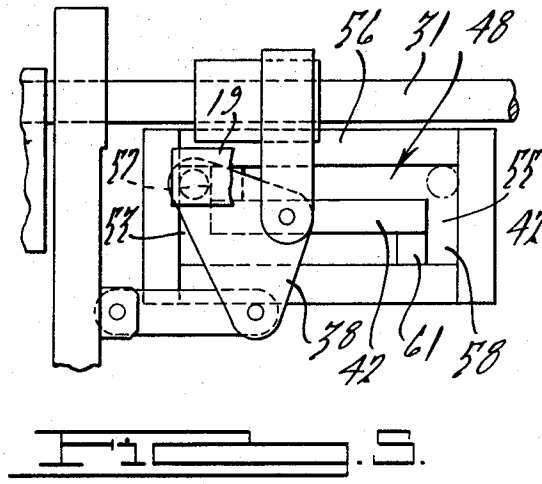


FIG. 5.

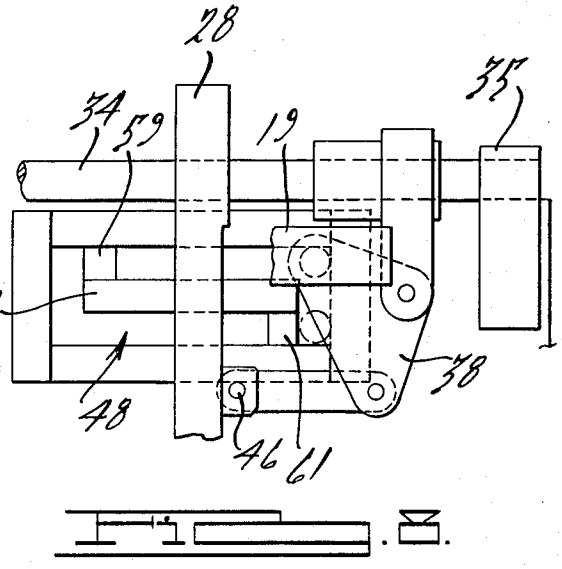


FIG. 6.

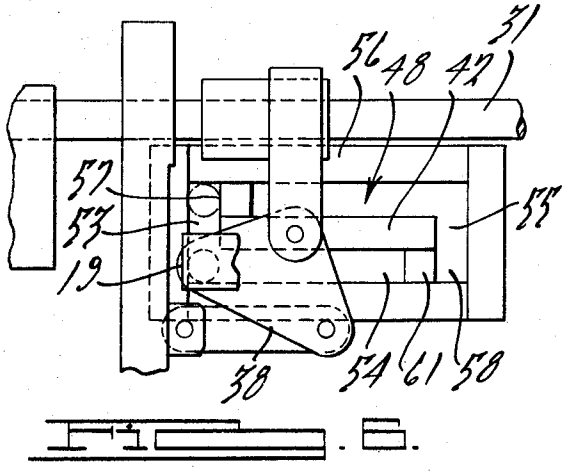
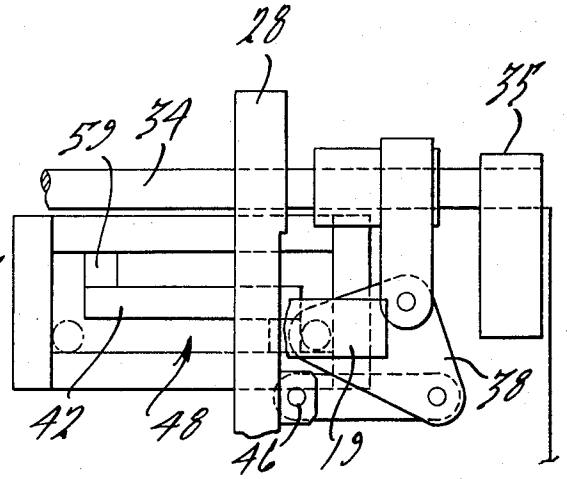


FIG. 7.



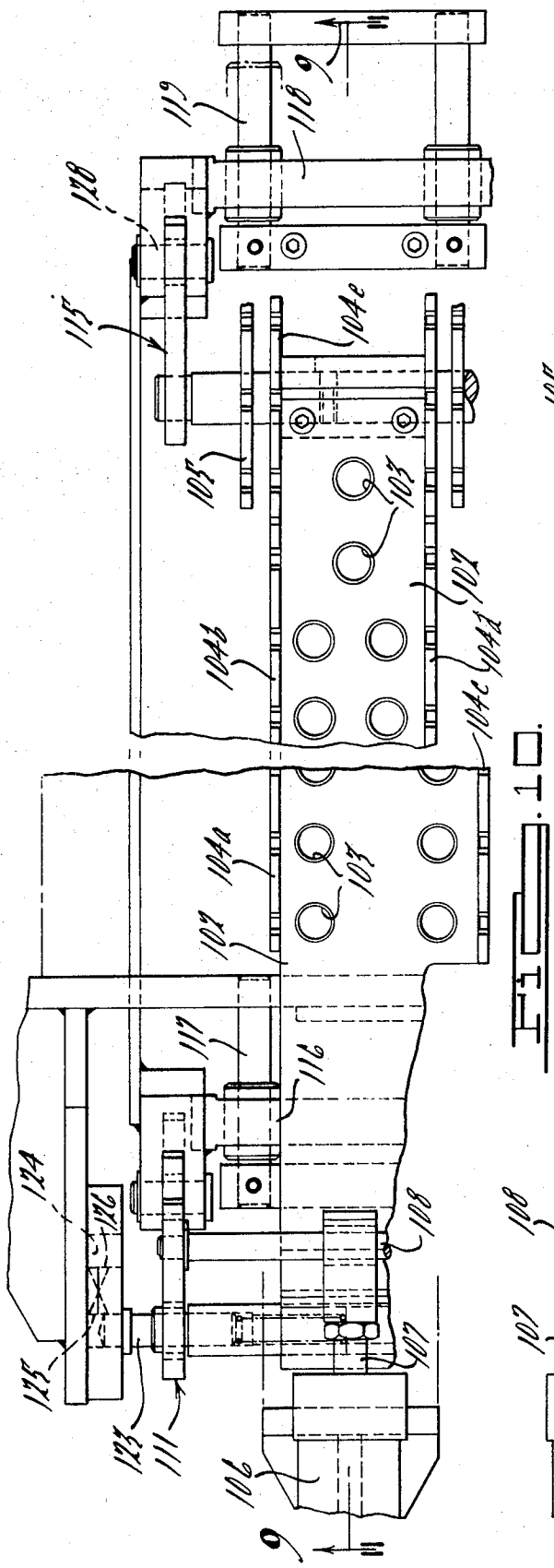


FIG. 10.

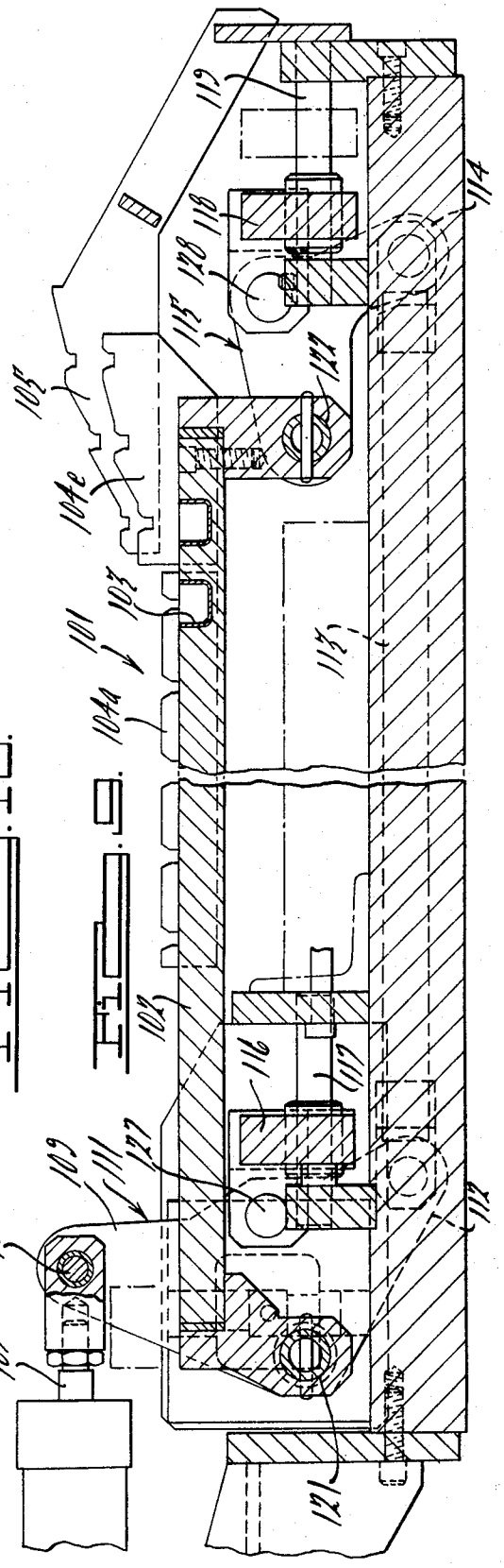


FIG. 9.

TRANSFER MECHANISM

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to mechanisms for transferring workpieces along a succession of stations. An example of the use of such transfer mechanisms is in a multiple station die press where stampings are to be advanced to succeeding stations on a press with each reciprocation of the ram of the press.

2. Description of the Prior Art

The following patents were discovered in a search:

2,840,219 Mervyn et al.	3,165,192 Wallis
2,929,485 Wallis	3,262,541 DeGain
3,135,395 Wallis	3,411,636 Wallis
3,155,217 Cross	

These patents all show mechanisms which are considerably different than that of the present invention. They have important drawbacks which it is an object of the present invention to overcome.

BRIEF SUMMARY OF THE INVENTION

According to the invention, one or more bars having workpiece-engaging members extending along the stations are actuated in a rectilinear path to engage the workpieces, move them toward the next stations, disengage the workpieces, and return to their former positions. The bars are moved by a reciprocating actuator which may be synchronized with the action of a press or other tool. The actuator is connected by linkage and bell crank means to the bars. The bell cranks carry cam followers engaging rectangularly-shaped cam tracks. The tracks have shoulders so positioned that the reciprocating motion of the actuator is transformed into rectilinear motion of the work-engaging bars.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view of a first embodiment of the invention in which the work-engaging bars move in a horizontal plane;

FIG. 2 is a cross-sectional view of the mechanism taken along the line 2—2 of FIG. 1;

FIG. 3 is a fragmentary cross-sectional view in elevation taken along the line 3—3 of FIG. 1;

FIG. 4 is a motion diagram of the work-engaging bars;

FIG. 5 is a partially schematic plan view of a bell crank and its associated mechanism when the workpiece-engaging bars are in a retracted and disengaged position;

FIG. 6 is a view similar to FIG. 5 but with the bell crank so moved so that the work-engaging bars are in their engaging position;

FIG. 7 is a similar view showing a bell crank at the other end advanced along with the work-engaging bar;

FIG. 8 is a view showing the bell crank of FIG. 7 rotated so that the work-engaging bar is disengaged from the workpiece in readiness for retraction to its former position;

FIG. 9 is a side elevational view of another embodiment of the invention in which the work-engaging bars move in a vertical plane, taken in cross section along the line 9—9 of FIG. 10; and

FIG. 10 is a top plan view of this embodiment, parts being broken away.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring first to the embodiment of FIGS. 1–8, the device is generally indicated at 11 and is intended to move a plurality of workpieces 12*a*, 12*b* . . . 12*f* along a succession of equidistantly spaced work stations. For example, part 12 may be a stamping which is to be moved from a loading station A through an idle station B, first and second draw stations C and D, a trim station E and then an idle station F. The part being circular in nature is engageable by a plurality of pairs of workpiece-engaging members 13, 14, 15, 16, 17 and 18. These members are located at stations A–F respectively when in their FIG. 1 positions, and will advance to the next station, members 18 are moving to a station G. All members 13–18 are notched as shown to engage the workpiece from opposite sides, and are fastened to a pair of bars 19 which extend parallel to the path of movement of the workpieces on opposite sides thereof. Bars 19 are movable from the position shown in FIG. 1 inwardly toward the workpieces, as shown by paths 21 in FIG. 4, and to the right in FIGS. 1 and 4 as shown by paths 22 until the workpieces are advanced to their next stations, and away from the workpieces as shown by paths 23 and finally along paths 24 to their original positions.

The means for moving bars 19 comprises an actuator 25 in the form of a reciprocable fluid motor which may be actuated each time the press ram is raised, or at any other desired interval. The piston rod 26 of this motor is connected to a crossbar 27, this bar being in turn connected to a similar crossbar 28 at the other end of the device by a pair of tie rods 29. Crossbar 27 rides on a pair of rails 31 supported by uprights 32 which in turn rest on a base plate 33. Crossbar 28 rides on a similar pair of rails 34 carried by uprights 35 mounted on the base plate.

Also carried by rails 31 and 34 are four carriages 36. Each carriage has a portion 37 extending inwardly toward the workpieces (FIG. 3), and a bell crank 38 is pivotally mounted in a slot 39 of extension 37 by means of a pivot pin 41. The bottom of this pivot pin rests on a platform 42 which extends parallel to the path of movement of the workpieces.

Each bell crank 38 has a slot 43, and a link 44 has one end disposed in this slot and is pivotally connected to the bell crank by a pin 45. The other end of this link is pivotally connected to bar 27 or 28 by a pivot pin 46. The arrangement is such that, with the parts initially in the position shown in FIG. 1, extension of piston rod 26 will advance pins 45 in the direction of advance of workpieces 12, whereas retraction of piston rod 26 will return pins 45 to their previous stations.

Each bell crank carries a cam follower 47 which extends downwardly therefrom and is urged into a cam track generally indicated at 48 by a spring 49. This spring is disposed in a recess 51 of an upwardly extending post 52 secured to the bell crank coaxially with cam follower 47. The ends of each work-engaging bar 19 are mounted on and secured to the tops of the two posts 52 on that side of the unit so that the path of movement of bars 19 will be controlled by the movement of these portions of the four bell cranks.

Each cam track 48 has four legs indicated at 53, 54, 55 and 56. These legs form a rectilinear path with the longer sides parallel to the desired movement of the

workpieces and of a length equal to the distance between the workpiece stations. The other two paths are at right angles to the movement of the workpieces and serve to guide the work-engaging bars toward and away from the workpieces. A pair of shoulders **57** and **58** are provided at the beginning of paths **53** and **55** respectively. These shoulders prevent cam follower **47** from backtracking and insure that the bell cranks will rotate to cause engagement of the workpieces before the bars are permitted to travel forwardly to the next stations, and to insure disengagement of the workpieces before the workpiece-engaging members are retracted to their original positions. For this purpose shoulders **57** and **58** have sloping entrances **59** and **61** respectively as shown in FIG. **2**, thus permitting cam followers **47** to ride up on these portions of cams **48** until they snap into position behind the shoulders. It will be noted that platforms **42** are located inside the paths of cam tracks **48**, and their ends are part of shoulders **57** and **58.**

The operation of this embodiment may perhaps be best understood with respect to sequential FIGS. **5–8.** Beginning with the parts as shown in FIGS. **1** and **5**, extension of piston rod **26** will cause bell cranks **38** to rotate so as to move bars **19** inwardly toward the workpieces. When cam followers **47** have cleared shoulders **57**, further extension of piston rod **26** will cause the entire assembly comprising crossbars **27** and **28**, carriages **37**, bell cranks **38**, work-engaging bars **19** and workpieces **12** to move to the right in FIGS. **1** and **6** with the bell cranks finally reaching the piston of FIG. **7.** In order to reach this position cams **47** will ride up on sloping surfaces **61** and snap into position behind shoulders **58.** The workpieces will then have been moved to their next stations.

Retraction of piston rod **26** will first swing the bell cranks so as to withdraw work-engaging bars **19** from the workpieces, cam followers **47** engaging shoulders **58.** When the shoulders have been cleared, continued retraction of piston rod **26** will cause cam followers **47** to ride along paths **56**, returning the workpiece-engaging bars to their original positions as shown in FIGS. **1** and **5.**

FIGS. **9** and **10** show another embodiment of the invention which is basically similar to the first embodiment, but in which the work-engaging means is movable in a vertical rather than a horizontal plane. The device is generally indicated at **101** and comprises a work-engaging bar **102** carrying a plurality of magnetic work-holding members **103** as well as an arrangement of side bars **104***a*, **104***b*, **104***c*, **104***d*, **104***e*, etc. which engage the work. Bar **102** and the work-engaging members carried thereby are to be lifted vertically from the position shown in FIG. **9**, moved horizontally to the right to carry the workpieces toward their next stations, dropped and then returned. A pair of stationary racks **105** are located near the exit of the device to hold the workpieces at successively higher elevations as they are advanced.

The work-engaging bar and members are moved by a reciprocable fluid motor **106** the piston **107** of which is secured to a crossbar **108.** This crossbar is connected to the upwardly extending arms **109** of a pair of laterally spaced bell cranks one of which is generally indicated at **111** at the entrance end of the device. Lower arms **112** of these bell cranks are connected by rods **113** to the arms **114** of a pair of bell cranks one of which is generally indicated at **115** at the exit end of the device.

Bell cranks **111** are pivotally mounted on carriages **116** carried by rails **117**, bell cranks **115** being pivotally supported by carriages **118** on rails **119.** The entrance end of work-engaging bar **102** is pivotally supported at **121** by bell cranks **111**, the opposite end of the bar being pivotally supported at **122** by bell cranks **115.**

A pair of spring-urged cam followers one of which is indicated at **123** carried by bell cranks **111** coaxial with pivot **121** ride in two cam tracks **124** similar to those of the previous embodiment. The cam tracks are of rectangular shape, having four legs and oppositely facing shoulders **125** and **126** with sloping entrances.

In operation of the embodiment of FIGS. **9** and **10**, extension of piston rod **107** from its position shown in the FIGS. **9** and **10** will first cause bell cranks **111** and **115** to rock about pivots **127** and **128** respectively which connect them with their respective carriages **116** and **118.** This will cause work-engaging bar **102** and its associated parts to lift the workpieces. When cam followers **123** have cleared shoulders **125** carriages **116** and **118** will advance along rails **117** and **119** respectively, with the workpieces being carried to their next stations. The cam followers will ride up on the sloping entrances leading to shoulders **126** and will snap into position behind these shoulders. Retraction of piston rod **107** will thus cause the bell cranks to be rocked counterclockwise about pivots **127** and **128**, lowering the workpieces at their next stations. When the cam followers clear shoulders **126**, the work-engaging bar will be retracted to its initial position.

I claim:

1. In a transfer mechanism for moving workpieces along equidistantly spaced stations, a work-engaging bar having work-engaging members spaced therealong, a reciprocable actuator, and means responsive to reciprocation of said actuator for moving said bar along a rectilinear path first approaching said workpieces, transferring said workpieces to their next stations, withdrawing from said workpieces, and returning to the original position, said means comprising a pair of bell cranks pivotally joined to said bar, pivotal supports for said bell cranks, guide means supporting said pivotal supports for movement parallel to the path of advancement of the workpieces, a connection between one arm of at least one bell crank and said actuator, a cam follower on at least one of said bell cranks, and a fixed cam track engaged by said cam follower for controlling pivotal movement of said bell crank.

2. The combination according to claim **1** in which said actuator is connected to both of said bell cranks.

3. The combination according to claim **2**, further provided with a second work-engaging bar on the opposite side of said workpieces from said first bar, a second pair of bell cranks, pivotal supports, links, cam followers and cam tracks for said second workpiece-engaging bar.

4. The combination according to claim **1**, said cam track having a rectilinear shape, and shoulders at diagonally opposite corners of said cam track for preventing reverse movement of said cam follower, said shoulders having sloping entrances permitting the cam follower to ride up.

5. The combination according to claim **1**, the rectilinear path of said work-engaging bar being in a horizontal plane.

6. The combination according to claim 5, further provided with a second work-engaging bar on the opposite side of said workpieces from said first bar, a second pair of bell cranks, pivotal supports, cam followers and cam tracks for said second work-engaging bar.

7. The combination according to claim 6, said cam tracks having a rectilinear shape, and shoulders at diagonally opposite corners of said cam track for preventing reverse movement of said cam followers, said shoulders having sloping entrances permitting the cam followers to ride up.

8. The combination according to claim 1, the rectilinear path for said work-engaging bar being in a vertical plane.

9. The combination according to claim 1, said connection between the actuator and each bell crank comprising an arm on one of said bell cranks connected to the actuator, and a link connecting said bell cranks.

10. The combination according to claim 9, said cam track having a rectilinear shape, and shoulders at diagonally opposite corners of said cam track for preventing reverse movement of said cam follower, said shoulders having sloping entrances permitting the cam follower to ride up.

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