

[54] **TRANSFER ASSEMBLY FOR
TRANSFERRING WORKPIECES FROM
STATION TO STATION ALONG A PRESS**

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

[58] Field of Search **214/1 BB, 730;
198/218**

[56] **References Cited**
UNITED STATES PATENTS

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[57] **ABSTRACT**

In a transfer assembly for gripping and transferring workpieces from station to station along a press, the guide tracks for the movement of the gripper carrying body are carried by a slide capable of vertical movement in the frame of the finger gripper mechanism actuator means being provided for effecting the vertical displacement of said slide with respect to the frame in order to lift and lower, respectively, the gripper fingers relatively to the press dies.

4 Claims, 6 Drawing Figures

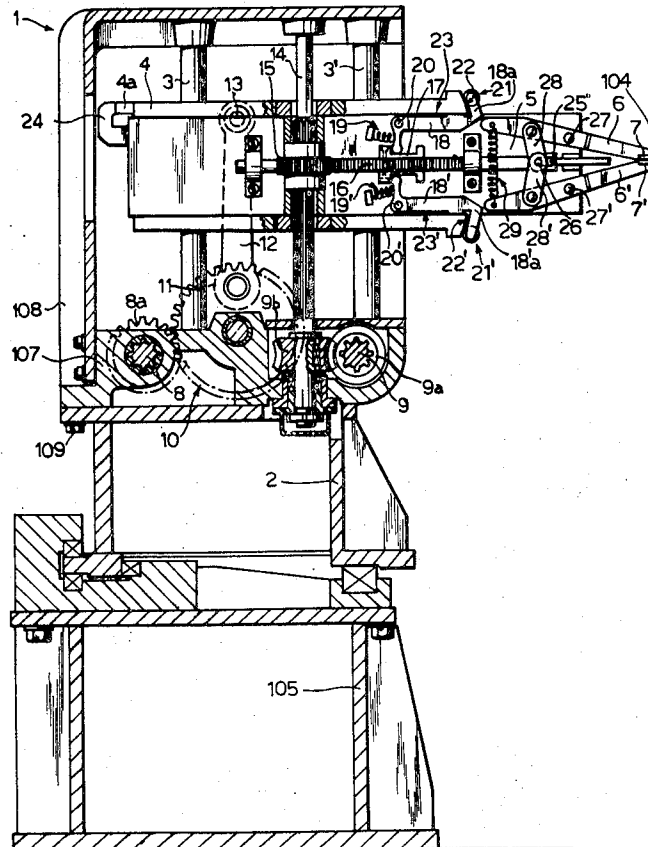


Fig. 1

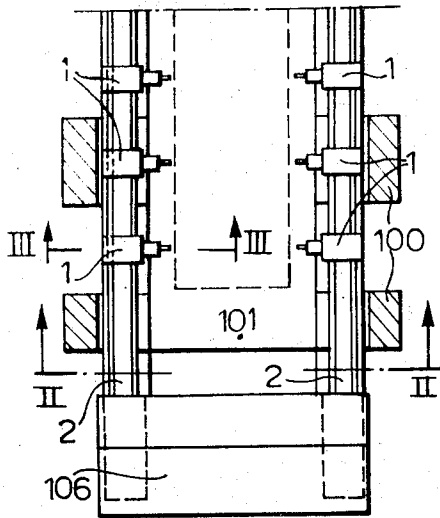


Fig. 2

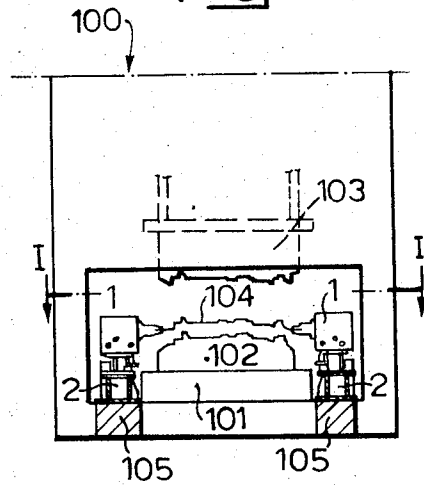
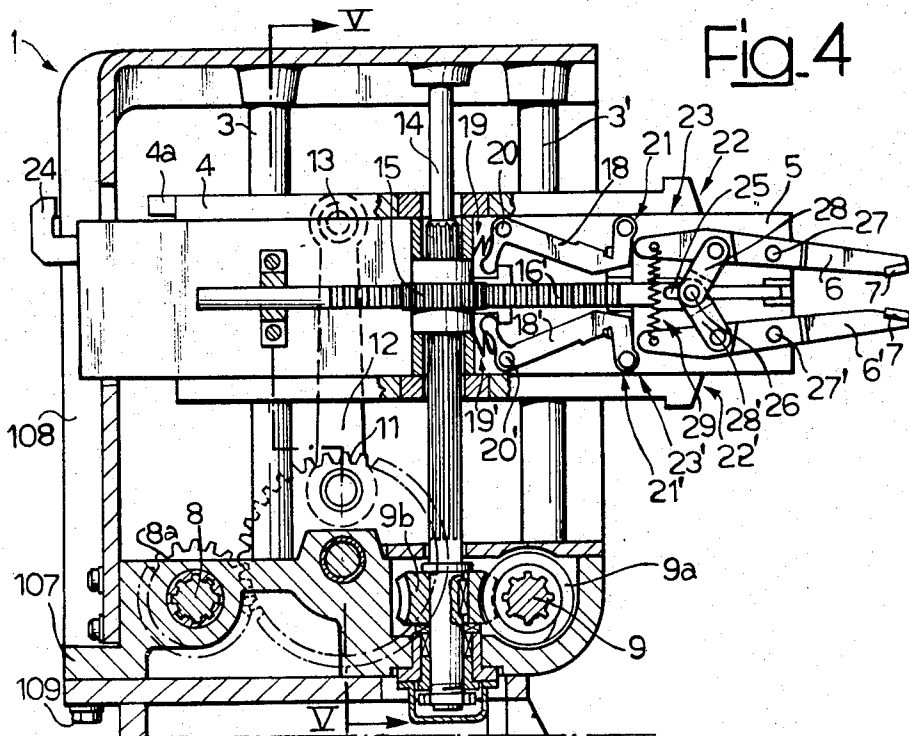


Fig. 4



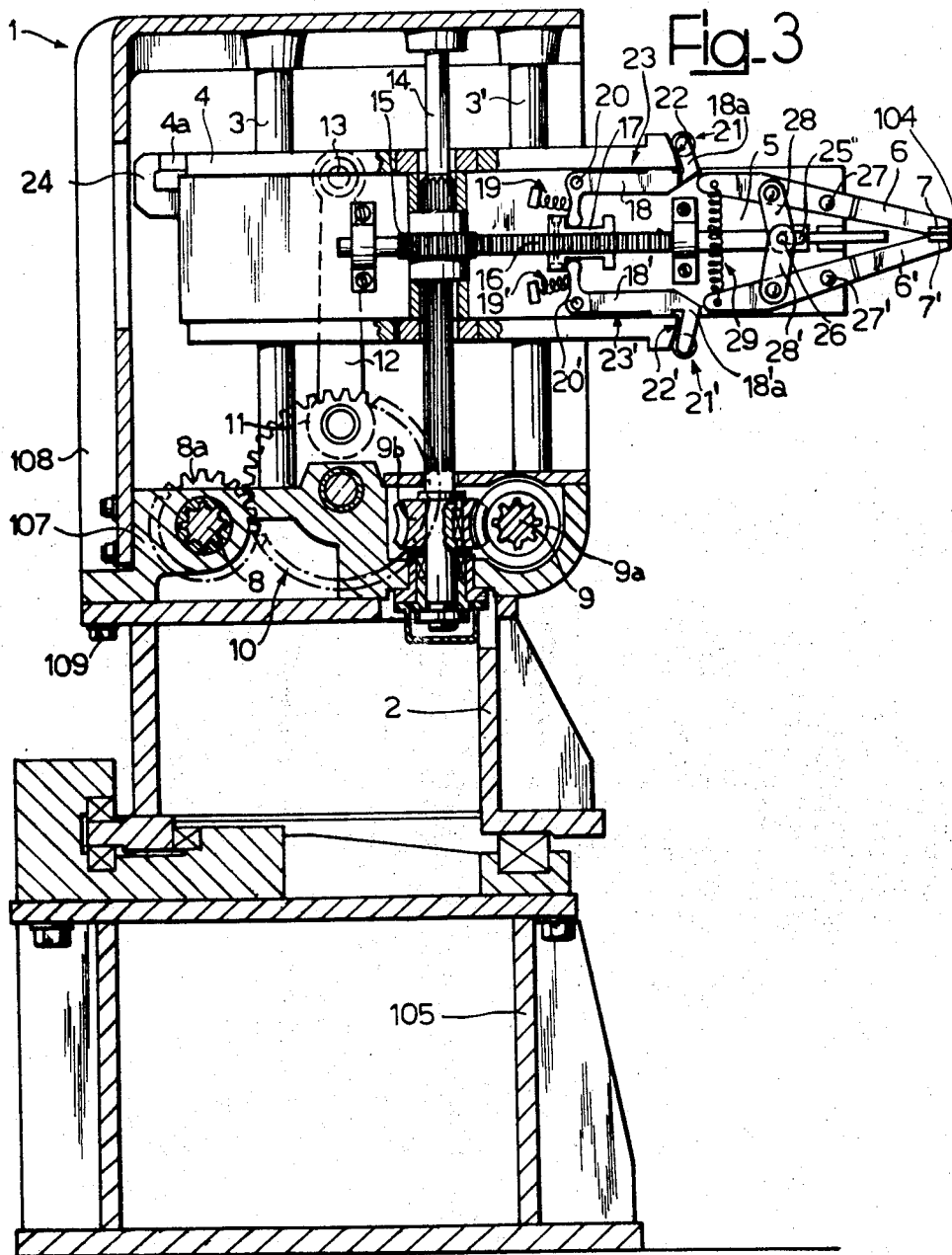


Fig 5

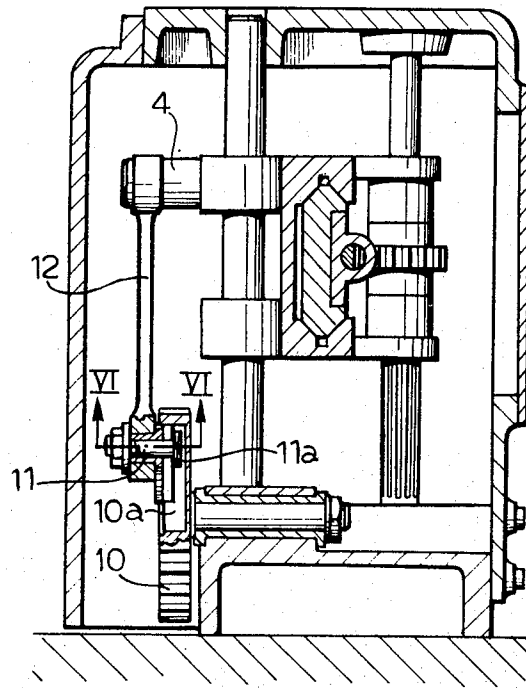
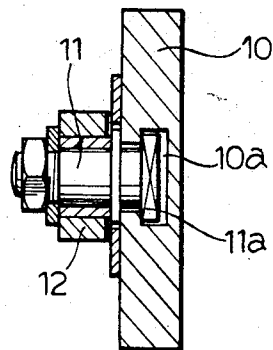


Fig. 6



TRANSFER ASSEMBLY FOR TRANSFERRING WORKPIECES FROM STATION TO STATION ALONG A PRESS

The invention relates to transfer assemblies for gripping and transferring workpieces from station to station along a press of the multiple die type.

Transfer assemblies for this use comprises grippers adapted to grip the workpieces pressed in a first die, lift it from the die, transfer it to a next die, lower it to enter this die and releasing the workpieces. The grippers are usually carried by two feed bars capable of longitudinal displacement arranged laterally of the dies to be served, actuator means effecting movement of the grippers transversely of the feed bars as well as opening and closing of the grippers. The grippers are lifted at the present state of the art by means of push rods arranged in the die which on completion of pressing protrude from the die for lifting the grippers by the necessary extent or by means of the feed bars which additionally perform a vertical movement by which the grippers carried by said bars upon engagement of the workpieces are lifted, axially displaced and again lowered.

Both known means of effecting vertical movement of the grippers are objectionable. The former requires all dies to be equipped with mechanical actuators driven by the gearing on the machine, the latter necessitates means for transmitting to the feed bars an additional lifting movement which obviously complicates the design of the bars and guides therefor.

The invention provides a transfer assembly for a press, which obviates the above recited drawbacks of known assemblies.

According to the invention a transfer assembly for gripping and transferring workpieces from station to station along a press, of the type comprising two feed bars capable of longitudinal movement arranged laterally of the dies to be served and a plurality of finger gripper mechanisms secured to each bar, each finger gripper mechanism comprising a frame, a gripper carrying body movable on guide tracks transversely of the feed bars, actuator means for effecting displacement of the gripper carrying body relatively to the guide tracks in order to draw the gripper fingers towards and away, respectively, from the workpiece and for effecting opening and closing of the gripper fingers is characterised by the fact that the guide tracks for the movement of the gripper carrying body are carried by a slide capable of vertical movement in the frame of the finger gripper mechanism, actuator means being provided for effecting the vertical displacement of said slide with respect to the frame in order to lift and lower, respectively, the gripper fingers relatively to the press dies.

Further features of the invention will appear from the appended description with reference to the accompanying drawings given by way of example, wherein:

FIG. 1 is diagrammatical part sectional view of a press provided with a transfer assembly according to the invention, the section being taken along line I—I of FIG. 2;

FIG. 2 is a diagrammatical sectional view on line II—II of FIG. 1;

FIG. 3 is an enlarged cross sectional view on line III—III of FIG. 1 showing the gripper fingers in their closed condition;

FIG. 4 is a sectional view similar to FIG. 3 showing the gripper fingers in their open condition;

FIG. 5 is a sectional view on line V—V of FIG. 3, and FIG. 6 is a sectional view on an enlarged scale on line VI—VI of FIG. 5.

In FIGS. 1 and 2, 100 denotes a press having a plurality of working stations. 101 denotes the bedplate of the press carrying a plurality of dies 102 cooperating with upper dies 103. 104 denotes a workpiece, 105 two guide tracks extending longitudinally one on each side of the dies 102.

Two feed bars 2 are slidably mounted on the guide tracks 105 as shown in FIG. 3. 106 denotes the housing for the mechanisms effecting in a known manner the longitudinal displacement of the feed bars 2 in timed relation to operation of the press.

A plurality of finger gripper mechanisms similar in construction are secured to each feed bar 2, each finger gripper mechanism being denoted as a whole by 1.

The structure and operation of a finger gripper mechanism shall now be described with reference to FIGS. 3 to 5. 107, 108 denote a divided carrying frame secured by means of bolts 109 to a feed bar 2. Two vertical bars 3, 3' are attached to the frame 107 and having sliding thereon, such as by means of antifriction bearings a slide 4 in which the gripper carrying body 5 is arranged for horizontal displacement.

The gripper fingers carried by the body 5 are denoted by 6, 6' and are provided with a plastic coating 7, 7' for reliable grip of the workpiece 104.

Two splined shafts 8, 9 extend longitudinally above each feed bar 2; the shafts 8 and 9 are drivingly rotated in timed relation to the press movements mechanisms known per se enclosed by the housing 106.

A pinion 8a is slidably keyed to the splined shaft 8 and is supported by the bottom portion 107 of the carrying frame for longitudinal movement therewith. The pinion 8a meshes with a toothed wheel 10 rotatably mounted in the portion 107. The disc of the wheel 10 is formed with a radial T-shaped groove 10a having adjustably mounted therein the prismatic head 11a of a pivot 11 to which a connecting rod 12 is articulated. The other end of the connecting rod 12 is articulated at 13 to the slide 4 so that on rotation of the splined shaft 8 the slide 4 is vertically reciprocated along the bars 3, 3'.

On each full turn of the wheel 10 acting as a crank the slide 4 performs a vertical motion adjustable in length by a displacement of the head 11a in the groove 10a, whereby the radius of the crank operating the connecting rod 12 is varied.

Correct positioning of the slide at its top and bottom positions is very easily performed by means of the crank-connecting rod unit described above effecting the vertical displacements of the slide 4. By causing said end positions of the slide to coincide with the dead points of the crank-connecting rod unit, any slight errors in angular positioning of the splined shaft 8 in its end positions but negligibly affect the position of the slide 4. Moreover, the motion law of the crank-connecting rod unit is such that accelerations and decelerations are acceptable even on quick operation.

The splined shaft 9 drives through a worm gear 9a, 9b a vertical splined shaft 14 having slidably keyed thereto a pinion 15 rotatably carried by the slide 4 for vertical movement therewith.

The pinion 15 meshes with a rack 16 slidably mounted on the gripper carrying body 5.

The rack 16 carries a grooved collar 17 engaging with axial play the ends of two bell crank levers 18, 18' hinged to the body 5 on pivots 20, 20'. The levers 18, 18' are biased by two compression springs 19, 19' tending to spread the ends 18a, 18'a of said levers on which rollers 21, 21' are rotatably mounted.

When the slide 4 fully protrudes from the body 5, as shown in FIG. 3, the rollers 21 and 21' roll over two tracks 22, 22' fixedly secured to the slide 4, the track being of an arcuate shape having its center on the center line of the pivots 20, 20'.

In the retracted position of the body 5 shown in FIG. 4 the rollers 21, 21' roll over rectilinear tracks 23, 23' carried by the slide 4 and extending parallel to the direction of movement of the body 5 within the slide 4.

The body 5 is provided at the back with a catch 24 which in the protruded position of the body 5 abuts a stop 4a on the slide 5.

The gripper fingers 6, 6' are hinged at the outer end of the body 5 to pivots 27, 27'. The fingers are connected by toggle levers 28, 28' to a pivot 26 sliding in a slot 25 in the rack 16.

The levers 28, 28' form together with the fingers 6, 6' a toggle mechanism. A spring 29 tends to spread the fingers 6, 6'.

The above described device operates as follows. When the body 5 is fully retracted into the slide 4 and the fingers 6, 6' are open (FIG. 4), the splined shaft 9 is rotated in a direction such as to move the rack 16 through the splined shaft 14 and pinion 15 to the right on the drawing with respect to the body 5 till the left-hand shoulder on the collar 17 contacts the inner ends of the levers 18, 18'. The rack 16 then carries along the body 5 through the levers 18, 18' of which the rollers 21, 21' roll over the tracks 23, 23' in the slide 4. The gripper fingers are thereby drawn towards the workpiece. As the body 5 fully protrudes from the slide 4 and the catch 24 abuts the stop 4a, the levers 18, 18' are released from the tracks 23, 23' and spread out, the rollers 21, 21' rolling during this step over the tracks 22, 22'.

The rack 16 is moved forward with respect to the body 5 and the fingers 6, 6' start closing against the action of the spring 29 till the levers 28, 28' reach beyond the dead point of the toggle mechanisms and irreversibly close the fingers 6, 6' on the workpiece 104.

The splined shaft 9 is then rotated to lift the slide 4 and the workpiece 104 clamped between the fingers 6, 6'. The feed bar 6 subsequently moves the finger gripper mechanism 1 to the next pressing station where reverse rotation of the splined shaft 8 causes the slide 4 to lower and the workpiece to be placed into a fresh die.

The gripper fingers 6, 6' are now opened and retracted. The splined shaft 9 is rotated in a contrary direction to the former, the body 5 is prevented from receding by the levers 18, 18', the rollers 21, 21' of which are engaged by the tracks 22, 22' (FIG. 3). The rack 16 starts receding from the body 5 taking up the play at the groove in the collar 17 and slot 25. The levers 18, 18' then rotate clockwise and the rollers 21, 21' ride over the tracks 22, 22' till the levers 28, 28' reach beyond their dead point, when the spring 29 opens the grippers 6, 6' by snap action to release the workpiece by virtue of the axial play between the pivot 16 and slot 25, said play being the same as between the inner ends of the levers 18, 18' and groove in the collar 17. As

soon as the rollers 21, 21' have left the curved tracks 22, 22' and come into contact with the rectilinear tracks 23, 23', the body 5 starts its backward movement and reaches its end position shown in FIG. 3 on completion of the cycle.

What we claim is:

1. A transfer assembly for gripping and transferring workpieces from station to station along a press of the type having two longitudinally movable feed bars arranged laterally of the dies to be served and a plurality of finger gripper mechanisms secured to each bar, each finger gripper mechanism comprising a frame, a gripper carrying body movable on guide tracks transversely of the feed bars, actuator means for effecting displacement of the gripper carrying body relative to the guide tracks in order to draw the gripper fingers toward and away from the workpiece and for effecting opening and closing of the gripper fingers, the improvement comprising slide means mounted in said frame for vertical movement, said guide tracks being mounted on said slide means for movably supporting said gripper carrying body, actuator means mounted in said frame for effecting the vertical displacement of said slide means with respect to the frame in order to lift and lower the gripper fingers relatively to the press dies, said actuator means comprising a crank rotatably supported in said frame and a connecting rod articulated at its ends to said crank and to said vertically movable slide means respectively, said crank comprising a toothed wheel, one face of which is provided with a radial T-shaped slot, and a prismatic head movably mounted in said slot and having a pivot thereon to which said connecting rod is articulated, and drive means for rotating said toothed wheel comprising a splined rotary shaft extending longitudinally above said feed bar and a pinion rotatably mounted in said frame in meshing engagement with said toothed wheel and slidably keyed to said splined shaft.

2. A transfer assembly as set forth in claim 1 further comprising a second splined rotary shaft extending longitudinally above said feed bar, a vertically extending splined shaft rotatably supported in said frame and gear means operatively connecting said second shaft to said vertically extending shaft, a rack slidably mounted in said gripper carrying body and disposed in operable driven engagement with said vertically extending splined shaft, a first lever pair pivoted on said gripper carrying body, lost motion coupling means between said rack and said first lever pair for effecting axial displacement of said gripper carrying body, a further spring-biased lever pair pivotally mounted on said body and toggle means operatively connected between said rack and said further lever pad for effecting closing and snap opening of said fingers.

3. A transfer assembly as set forth in claim 2 wherein said first lever pair is comprised of a pair of bell crank levers centrally articulated to the gripper carrying body, one end of each lever being engaged with axial play by a collar carried by said rack and slidable at the opposite ends on two guide tracks carried by said slide means, each guide track comprising a first rectilinear section parallel to the direction of movement of the gripper carrying body and an end section of circular profile having its center on the center line of the pivot for said bell crank levers.

4. A transfer assembly as set forth in claim 2 wherein said further lever pair are articulated at one end to a

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common pivot pin movable in a slot in said rack and articulated at their opposite ends to said fingers of the gripper intermediate the pivots upon which the fingers are articulated to said gripper carrying body and the rear ends of said fingers, spring means interconnecting 5

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the rear of said finger ends with the lost motion rate of the common pivot pin in the slots being substantially equal to the lost motion rate of the ends of the levers of the first lever pair in the collar on said rack.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,771,669 Dated November 13, 1973

Inventor(s) Franco MAGGIONI

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

IN THE HEADING:

Foreign Application Priority Data Missing -- Insert the following:

-- Italy 67150-A/71, filed January 16, 1971 --

Signed and sealed this 16th day of April 1974.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents