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3,354,766

TOOL CARRYING DEVICE FOR AN ECCENTRIC PRESS

Filed June 14, 1965

2 Sheets-Sheet 1

FIG. 1

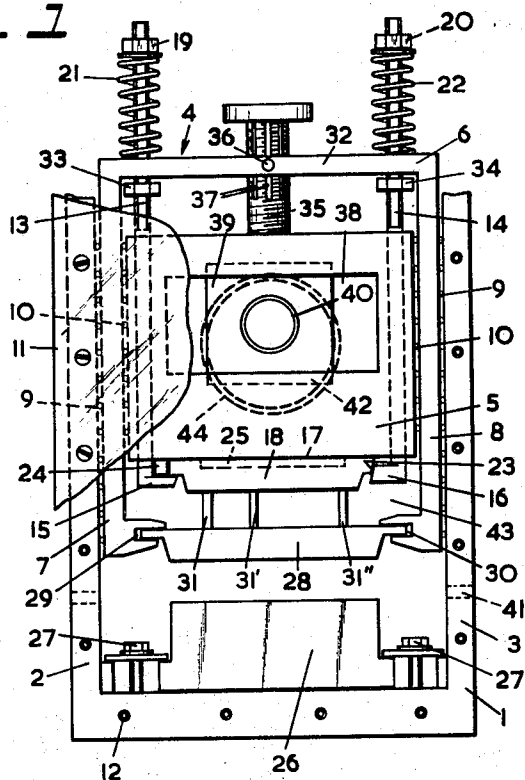
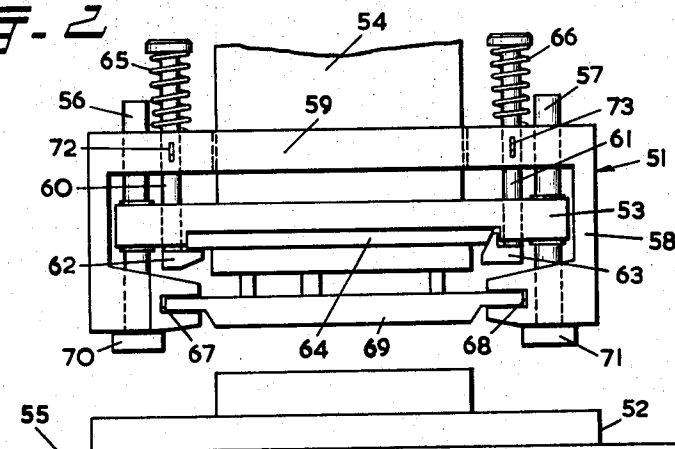


FIG. 2



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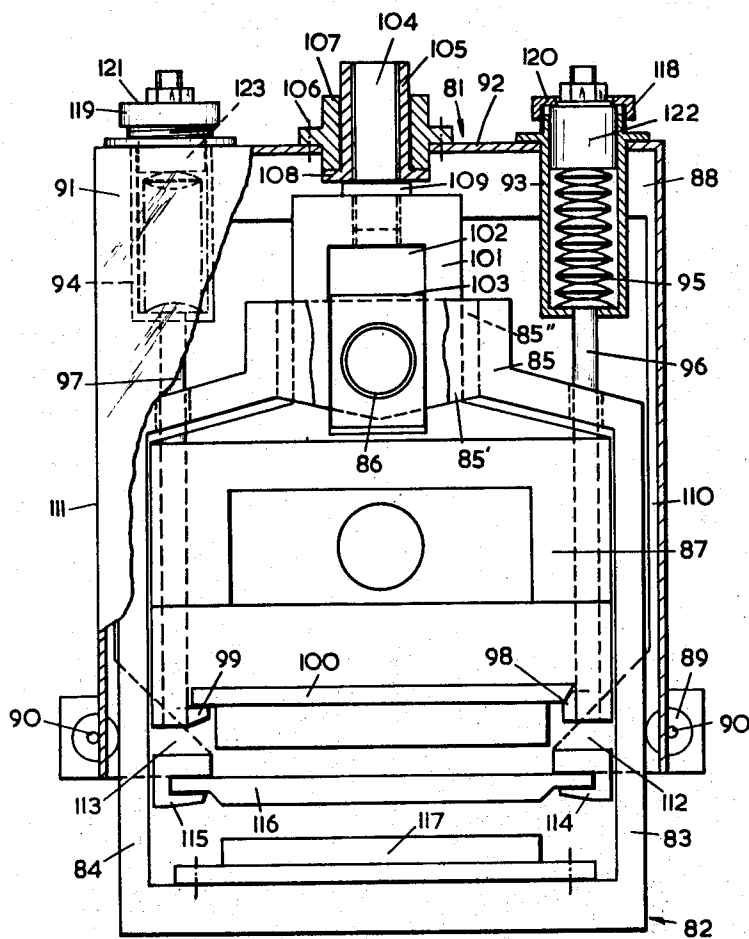


FIG. 3

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TOOL CARRYING DEVICE FOR AN ECCENTRIC PRESS

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ABSTRACT OF THE DISCLOSURE

A tool carrying device for securing a punch tool in an eccentric press which is provided with a main carrier for carrying the main tool part and an auxiliary carrier associated with such main carrier. A guide plate is mounted on the auxiliary carrier and both carriers are guided relative to one another in the operating direction. Resilient means cooperate with the auxiliary carrier and the auxiliary carrier is movable relative to the main carrier from a stop position against the action of the resilient means when the auxiliary carrier is retained by a counter tool carrier. Means are provided for securing the tool parts removably against a work holding surface upon the main carrier and the clamping means for such parts are spring biased by the resilient means so that a substantial neutralization of the resilient means allows the tool part to be removable in a direction transverse to the operative direction.

This invention relates to a tool carrying device for securing a press tool in a press, such as an eccentric press, and comprising at least one tool carrier having a holding surface for a main tool section.

It is an object of the invention to provide a carrying device of this type, which enables a rapid and precise set up of the tool sections, improved guidance to the tool sections relative to each other, thereby to prolong the life of the cutting elements of such tool, and in which improved spring action is obtained for pressing down the material to be worked and for stripping such material from said cutting elements, the carrying device being designed to perform some functions normally performed by the tool sections, as a consequence of which the tool can be made cheaper.

According to the invention, there is provided a tool carrying device for securing a press tool in a press, such as an eccentric press, and comprising at least one tool carrier which is constituted by a main carrier having a holding surface for a first main tool section, and an auxiliary carrier movable under guidance relative to said main carrier in a direction of operation and spring-biased to an end position, said auxiliary carrier including means for separately carrying a part of said main tool section in spaced relationship to the holding surface of the main carrier.

In addition, spring-biased holding members may be used for clamping a main tool section against the holding surface of said main carrier, and furthermore the same spring means may be used for supplying spring tension both for clamping down said main tool section, and for

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maintaining said auxiliary carrier in spring-biased condition.

The invention will be elucidated by a description of three, merely exemplary embodiments with reference to the accompanying diagrammatic drawings, which each illustrate one of said embodiments in front elevation.

FIGURE 1 is a diagrammatic view of one form of the invention with parts broken away.

FIGURE 2 is a similar view of a second modification and

FIGURE 3 is a similar view of a third modification.

Referring to FIGURE 1, the tool carrying device comprises a lower tool carrier 1, and a composite upper tool carrier, generally indicated at 4, which carriers 1 and 4 are formed with mutual guidance, so that they need not be guided by members of the press to be used. The lower carrier 1 constitutes a rigid unit with uprights 2, 3 and a back plate 43, and includes means for suspending the carrier 1 from the mainshaft of a press, said means to be described hereinafter.

The upper tool carrier generally indicated at 4 comprises a main carrier 5 and an auxiliary carrier 6 in the form of a frame and having uprights 7 and 8.

The pairs of uprights 2, 7 and 3, 8 are provided with facing groove tracks for balls 9, and likewise the uprights 7, 8 and the side faces of the main carrier 5, located opposite each of said uprights, are provided with groove tracks located opposite each other in register for balls 10, so that the tool carriers 1 and 4 can only perform true rectilinear movement in the vertical direction relative to each other. It will be understood that other types of rectilinear guidance, for example, by means of sliding and retaining strips, are equally applicable, in which connection retaining guidance of the movable members in the direction perpendicular to the plane of the drawing may be provided by the cover plate 11, only a small portion of which is shown in the drawing, which plate is secured in the lower carrier 1, 2, 3 by means of bolts through holes 12.

Collets 13 and 14 are mounted for sliding movement through bores in the main carrier 5, extending in the direction of relative movement of the tool carriers 1 and 4, said collets carrying at their lower end fingers 15 and 16, which together with the bottom face of the main carrier 5, which functions as a holding surface 17 for a main tool section, define slots opening towards each other, and likewise open laterally as viewed in the direction of projection perpendicular to the plane of the drawing, so that, for example, a punch plate 18 of a main tool section can be inserted in the direction of projection, when the fingers 15, 16 are sufficiently spaced from the holding surface 17. The collets 13, 14 are maintained under tension by means of springs 21, 22, disposed under nuts 19, 20, and thereby the punch plate 18 is held against the holding surface 17. The finger 16 has a bevel 23, which cooperates with a corresponding bevel on the punch plate 18, which on the side opposite the bevel 23 engages a fitting strip 24 of the main carrier 5. When the punch plate 18 is inserted, the end position is reached when it engages a fitting strip 25 of the carrier 5. It will be understood that it is also possible to use other means, such as positioning pins, for the true positioning of the punch plate 18.

The lower carrier 1 may be provided with similar positioning means not shown, which are adapted in conjunction with standardized faces of the tools to be set up to the positioning means of the upper carrier, so that the tool sections may be set up rapidly in their true positions relative to each other. Mostly, however, it will be sufficient to secure the lower main tool section 26 in the conventional manner by means of bolts 27 to position the same for cooperation with the upper tool section.

When the punch plate 18 is inserted in the slots 15, 17 and 16, 17, the guide plate 28 of the upper main tool section is at the same time inserted in the slots 29 and 30 at the lower ends of the auxiliary carrier uprights 7 and 8, respectively, said slots being open towards each other and laterally. The guide plate 28 need not be fixed in the slots 29, 30, since its position in the direction transverse to the direction of operation is determined by the guide pins and/or punches 31, 31', 31'' In the vertical direction, the guide plate 28 is a sliding fit in the slots 29, 30.

During the insertion of the upper main tool section, the fingers 15, 16 must be free of the action of the springs 21 and 22, respectively. This may be achieved in various manners, for example, by means of temporarily inserting wedge members, by screw means, by means of manually operated shoulder members, or by untightening the nuts 19, 20.

As shown in FIGURE 1, there are provided for this purpose pairs of adjustment nuts 33 and 34 on the collets 13, 14, which nuts define an end position for the collets 13, 14 relative to the auxiliary carrier 6 against the bottom face of the horizontal frame member 32 of the auxiliary carrier 6, on which the springs 21, 22 are supported. During normal operation, when the punch plate 18 is inserted, the collets 13, 14 will not reach this relative end position, since the auxiliary carrier 6 and the main carrier 5 are stopped relative to each other slightly earlier, which stop position is determined by a bolt 35, adjustably screwed in the frame member 32, with a resilient arresting pawl 36, engaging one of the slots 37 of the bolt 35. By adjustment of the bolt 35, or the nuts 33, 34, the latter can be caused to assume the stop position against the frame member 32 when the main carrier 5 is still in spaced relationship to the bolt 35. The auxiliary carrier 6 will then move downwardly over this distance relative to the main carrier 5 by gravity, and take along the collets 13, 14, so that the punch plate 18 is released of the set-up tension, and space is created to remove the tool section and insert another tool section. The set-up of the newly inserted tool section only requires re-adjustment of the bolt 35, or of the nuts 33, 34.

Mounted for horizontal movement in the rectangular opening 38 of the main carrier 5, is a block 39, provided with a journal bore 40 for receiving the eccentric pin of an eccentric press, for driving the upper tool carrier to operate on a strip of material set to the opening 41 in frame member 2 or 3.

The eccentric pin in the journal 40 constitutes part of the mainshaft 42, on which is mounted a bushing 44, secured in the back plate 43 of the carrier 1. This makes it possible to impart a lateral movement to the whole tool carrying unit for adaptation to the rate of supply of the strip of material, while further the reaction forces are taken up by the mainshaft of the press without any load on the frame of the press. Particulars in this respect have already been described elsewhere; they are therefore further left out of consideration in this description. It should only be noted, however, that in this case, too, it is possible to construct a tool carrying device in the above-described manner, suspended from two or more synchronized mainshafts with eccentric.

When, during operation of the press, the guide plate 28 strikes the lower main tool section 26, clamping the strip of material between them, the main carrier is moved on relative to the auxiliary carrier 6, which keeps the strip of material clamped against the tool section 26 by means of the joint force of the springs 21, 22, while the punches 31, 31', 31'' . . . , guided by the guide plate 28, move further downwards with the punch plate 18 for operation on the strip of material in cooperation with the cutting edges formed in the section 26. The great length of guidance between the tool carrier parts is a particular advantage in respect of the guidance of the punches 31, 31', 31'' . . . relative to the cooperating cutting edges in the

counter section 26. Not only is this an accurate guidance in general respects, it is particularly accurate and stable as a rectilinear guidance, permitting no cant of the guide plate 28 whatsoever. Die-cutting often involves great forces which are not uniformly distributed, which may be an interfering factor especially during the return movement, during which the springs acting on the guide plate 28 must provide the counter force for the withdrawal of the punches from the holes punched in the strip of material, which often grip the punches very tightly. In prior devices, these so-called stripping forces may dislocate the guide plate, which creates further clamping forces, and results in rapid wear of the punches and, as a consequence of the resulting disalignment, of the cutting edges. On the other hand, the space between the guide plate and the punch plate 18, which has hitherto been used for accommodating the springs, does not permit the provision of strong springs having a low spring constant, so that the prior dies often operate in the border area of the permissible specific load of the spring material, as a result of which breakage of springs is a frequent cause of breakdown.

By virtue of the fact that the upper tool carrier takes over the guidance of certain tool elements relative to each other, and also provides unlimited space for the provision of counter-pressure springs, a considerable improvement is obtained as far as the above drawbacks are concerned. As a result of this change in functions, the tools can be made cheaper, have a longer life, and the mounting in the press will require less time.

By using the springs 21, 22 both for providing the tension for clamping the punch plate, and for providing the compressive force of the guide plate, a simplification of the construction of the tool carrying device is obtained.

FIGURE 2 illustrates an embodiment in which the upper tool carrier 51 is not directly combined with the lower tool carrier 52 to a coordinated unit. Both sections, 51 and 52, are designed for being secured in a conventional, normal press. Of the upper tool carrier 51, the main carrier 53 can be secured against the bottom face of the punch 54 of a press by conventional means, not shown in the drawing, the table of such press being designated by 55, on which a lower tool carrier 52, or the lower tool section direct, can be secured.

Immovably fixed in bores of the main carrier 53, are guide bars 56, 57, the upwardly and downwardly extending ends of which are sliding fits in bores of the auxiliary carrier 58, thereby imparting rectilinear guidance to the same relative to the main carrier 53. The auxiliary carrier 58 has an upper cross-plate 59 with an opening through which extends the punch 54, as well as bores through which pass the collets 60, 61, which also pass through corresponding bores in the main carrier 53, for clamping a punch plate 64 of a tool against same by their fingers 62 and 63, respectively, in the same manner as described in conjunction with FIGURE 1. Springs 65 and 66, bearing on the auxiliary carrier plate 59, keep the collets 60, 61 under tension and at the same time exert a permanent downward bias on the auxiliary carrier 58, adapted to carry a guide plate 69 of a tool at its lower end in slots 67, 68. So long as the guide plate 69 does not press against the main tool section 52, the downward end position of the auxiliary carrier 58 is determined by the bushings 70 and 71. In order that the FIGURES 62, 63 can be released of spring pressure for exchanging the tool, by means of wedges, wedge openings 72 and 73 are provided in the auxiliary carrier plate and the collets.

As far as the support, guidance and set-up of the upper tool section are concerned, the operation of the carrying device shown in FIGURE 2 corresponds with that of the device illustrated in FIGURE 1.

FIGURE 3 shows a carrier device, the upper and lower carriers 81 and 82, just as in the device shown in FIGURE 1, constitute a complete unit with internal mutual guidance of the parts, independently of the press to be

used. This device is adapted for movement relative to the press, coordinated with the feed of material, about a separate trunnion. To this effect the lower carrier 82 is constructed in the form of a frame, comprising uprights 83, 84 and an upper yoke 85, the center part of which consists of two parallel webs 85', 85'', in which journal-bushings 86 are coaxially mounted for suspension of the carrier 82 from a trunnion of the press. The means for coordinating the rocking movement of this tool carrier device are not further described in this specification, for the same reasons as in respect of the device shown in FIGURE 1.

The main carrier 87 of the composite upper tool carrier 81 is guided on the inside of the uprights 83, 84 of the frame-shaped carrier 82, which may be effected by means of balls or sliding blocks, not shown. The auxiliary carrier 88 is guided against the outside of the uprights 83, 84 by means of travelling rollers 89, rotatable about spindles 90 secured to the auxiliary carrier 88. Of the auxiliary carrier 88, made of steel sheet, FIGURE 3 mainly illustrates a cross-section parallel to the plane of the drawing, so that the front plate 91 of the auxiliary carrier is only shown in part, which front plate ensures the rigidity of the unit mainly constituted by the upper frame member 92 and the side frame members 110, 111. Countersunk in the upper frame member 92, are bushings 93, 94, for accommodating Belleville washers 95 for tensioning the collets 96 and 97, which are a sliding fit in bores in the main carrier 87 for clamping the punch plate 100 of a tool section against the bottom face of the main carrier 87 in the same manner as described in conjunction with FIGURE 1.

The main carrier 87 has an upward extension 101, which extends between the two parallel webs 85' and 85'' of the yoke 85 of the carrier 82, and has a rectangular opening 102 to afford space to the trunnion from which the yoke 85 can be suspended. Fitting the opening 102 is a sliding block 103, which also has a bore corresponding with the bores of the bushings 86 for fitting the trunnion intermediate the bushings 86, so that guidance between the lower carrier 82 and the main carrier 87 is also obtained in the upper section of the structure.

Screwed in the upper end of the extension 101 is a collar bolt 104 having threaded ends extending downwardly and upwardly. Screwed on the latter end is a collar bushing 105, which is a sliding fit in a guide bushing 107 secured in a hole in the upper frame member 92 of the auxiliary carrier 88 by means of bolts 106, so that the auxiliary carrier 88 is guided relative to the main carrier 87 at its upper end. At this point the bushing 107 also defines the downward end position for the auxiliary carrier 88 relative to the main carrier 87 via collar 108 of the bushing 105 and collar 109 of the bolt 104.

The lower ends of the lateral frame members 110, 111 of the auxiliary carrier 88, which are U-shaped in section, extend inwardly beyond the frame members 83, 84 of the carrier 82 by members 112 and 113 of the U-legs, which extensions carry at the inner end cross-members 114 and 115, respectively, which are provided with slots opening towards each other, in which a guide plate 116 of a tool can be inserted, the lower part 117 of which is secured to the holding face of the carrier 82.

Means for temporarily relieving the fingers 98, 99 of the tension of the springs 95 are provided by threaded bushings 118, 119, which are adjustable on upwardly extending threaded ends of the bushings 93 and 94, respectively, to take up the force of the springs 95 by their collars 120 and 121 via the guide blocks 122 and 123, retained on the collets by nuts.

The use and operation of the device illustrated in FIGURE 3 are otherwise entirely as described in respect of the device shown in FIGURE 1.

Although the invention has been described in the light of three specific embodiments, it will be evident to those skilled in the art that it is possible to make modifications

and alterations without departing from the spirit and scope of the invention as defined in and by the following claims.

What is claimed is:

1. A tool carrying device for securing a punch tool in an eccentric press having a tool carrier comprising a main carrier having a holding surface for a first main tool section, an auxiliary movable carrier guided by said main carrier, resilient means biasing said auxiliary carrier towards an end position, carrying elements on said auxiliary carrier for separately carrying part of said main tool section in spaced relationship to said holding surface, said carrying elements including a collet element to clamp said main tool section against said holding surface through the action of said resilient means whereby said resilient means provides the spring tension for clamping said main tool section against said holding surface and at the same time provides the spring tension for urging said auxiliary carrier to an end position relative to said main carrier.
2. A tool carrying device as set forth in claim 1 wherein said carrying elements define slots open towards each other for receiving part of a main tool section, said slots also having an open end laterally.
3. A tool carrying device as set forth in claim 1 wherein a plurality of collet elements are provided guided by said main carrier, and, when in position for receiving said main tool section, define together with said holding surface slots opening towards each other and also having a lateral open end.
4. A tool carrying device as set forth in claim 1 comprising adjustable stop means for defining an end position of said auxiliary carrier relative to said main carrier.
5. A tool carrying device as set forth in claim 1 comprising means for relieving said collet element in clamping said main tool section against said main carrier.
6. A tool carrying device as set forth in claim 1 wherein said auxiliary carrier substantially embraces said main carrier.
7. A tool carrying device as set in claim 1 wherein guiding means on said auxiliary carrier are provided and counter tool carrying means are guided by said guiding means in the direction of operation.
8. A tool carrying device as set forth in claim 1 wherein said auxiliary carrier embraces said main carrier and a frame for carrying a counter tool is mounted on said auxiliary carrier and guided thereon.
9. A tool carrying device as set forth in claim 1 wherein a frame carrying a counter tool is provided and said auxiliary carrier is located on the outside of said frame and said main carrier is located inside said frame.
10. A tool carrying device as set forth in claim 1 wherein an eccentric drive member is connected to said main carrier.
11. A tool carrying device according to claim 10 wherein said main carrier is provided with a slot and a block is guided for sliding movement transversely of the direction of operation in said slot, said block having an opening for journalling said eccentric.
12. A tool carrying device for securing a punch tool in an eccentric press, comprising a main carrier for carrying a main tool part, an auxiliary carrier associated with said main carrier, a guide plate mounted on said auxiliary carrier, said carriers being movably guided relative to one another in the operating direction, resilient means cooperating with said auxiliary carrier, said auxiliary carrier being movable relative to said main carrier from the stop position against the action of said resilient means when said auxiliary carrier is retained by a counter tool carrier upon the approach movement of said main carrier to said counter tool carrier, stop elements cooperating with said auxiliary carrier, means for securing tool parts removably against the work-holding surface of said main carrier, clamping means biased to the work-

holding surface of said main carrier through the action of said resilient means which bias said auxiliary carrier for clamping a main tool part against said work-holding surface of the main carrier in a position determined by said stop elements so that substantial neutralization of said resilient means is sufficient for the main tool part to be removable in a direction transverse to the operative direction.

13. A tool carrying device as set forth in claim 12 wherein said counter tool carrier is suspended from the mainshaft of the press.

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