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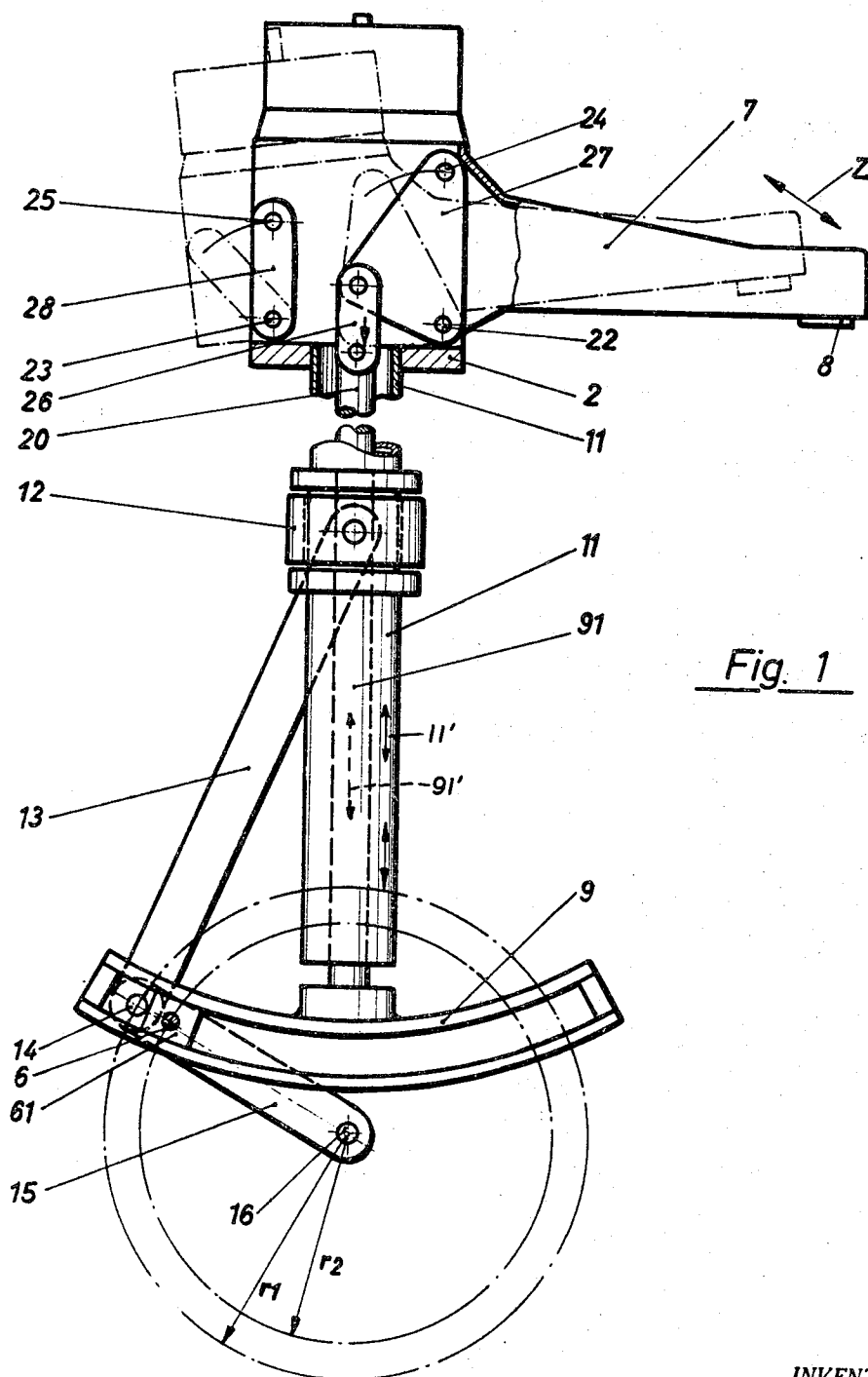
E. GRIMM

3,380,239

APPARATUS FOR THE REMOVAL OF FULL COPS ON RING
SPINNING AND RING TWISTING MACHINES

Filed Nov. 16, 1966

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

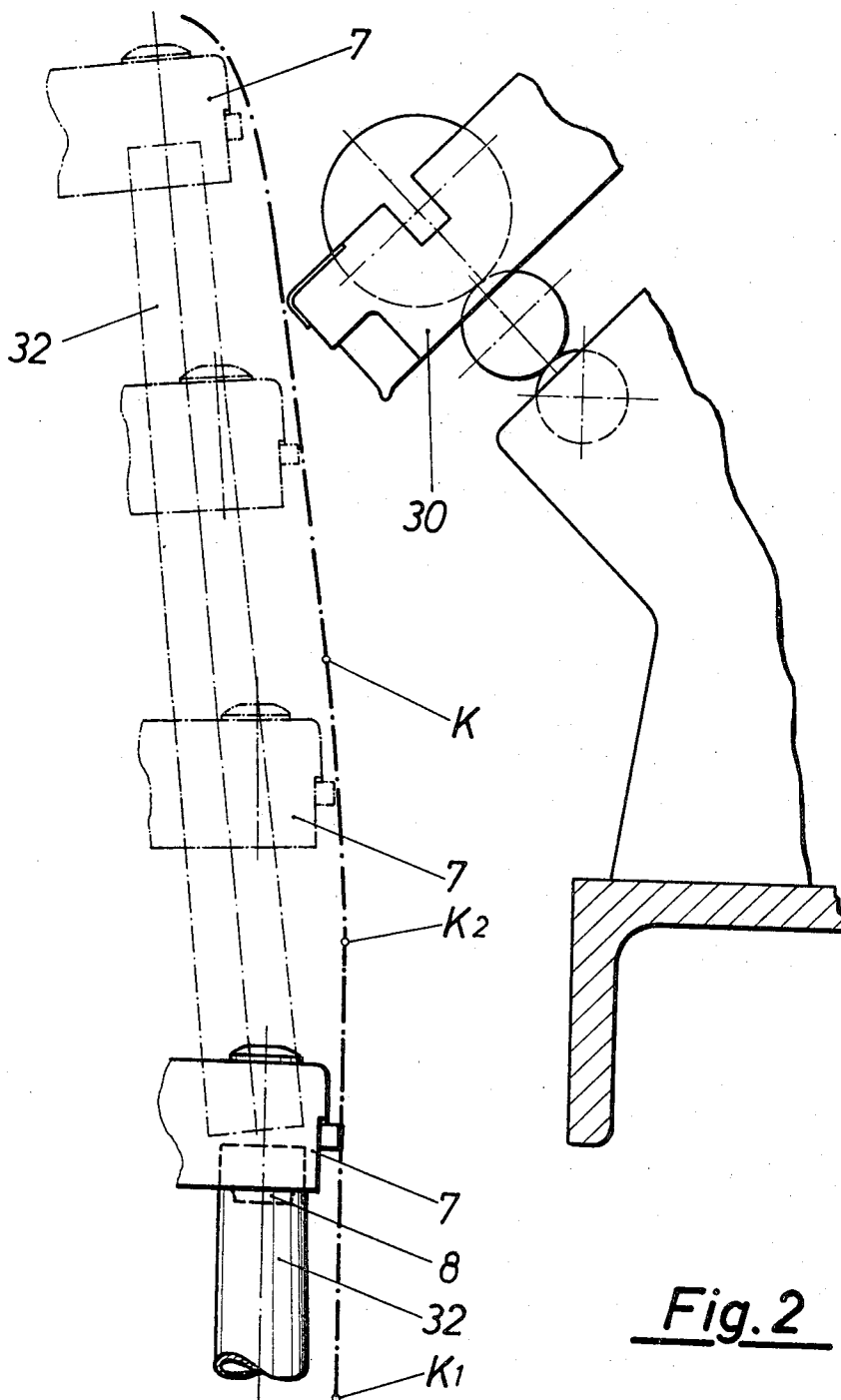


Fig. 2

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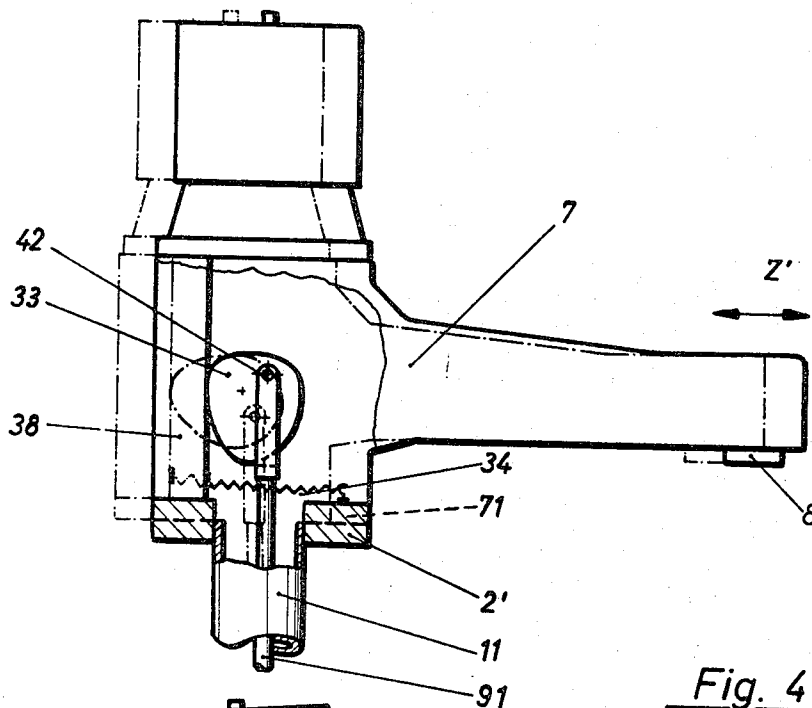


Fig. 4

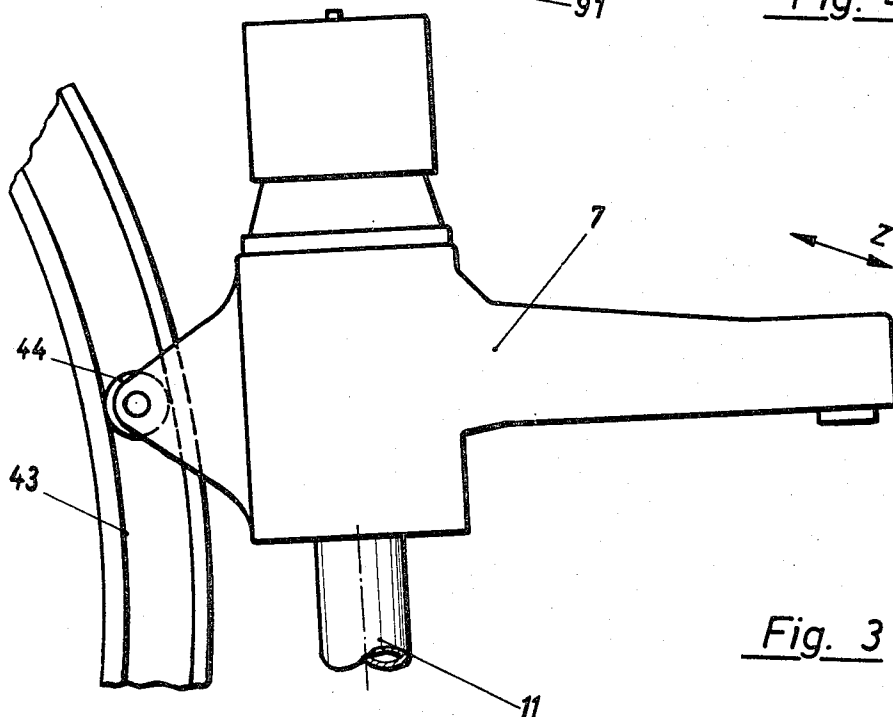


Fig. 3

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APPARATUS FOR THE REMOVAL OF FULL COPS ON RING SPINNING AND RING TWISTING MACHINES

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8 Claims. (Cl. 57—53)

ABSTRACT OF THE DISCLOSURE

The invention is directed to an improvement in doffing apparatus for coping machines, wherein the coping machine includes an auxiliary element disposed over the spindles from which cops are to be removed. The auxiliary element prevents lifting the cop vertically upward along the axis of the spindle by a cop removing means which engages the top portion of the cop and lifts it vertically from the spindle. According to the invention, the gripper which lifts the cop off a spindle is moved outwardly of the coping apparatus as it is raised, and the gripper passes over a path avoiding interference with the auxiliary element of the coping machine. The outward movement of the cop as it is lifted, in consequence of the outward movement of the gripper, is permitted by a taper between the cop and spindle. The doffing apparatus is of the type that travels at a constant speed along the coping apparatus, and automatically removes the cops during such travel. The apparatus is provided with means for eliminating relative movement of the cop and spindle, in the direction of travel of the doffing apparatus, during the time that the cop is being removed. The movement according to the instant invention, providing outward movement of the gripper, is coordinated with the mentioned operation wherein relative movement between the cop and spindle, in the direction of travel of the doffing apparatus, is eliminated.

The invention relates to an apparatus for the continuous replacement of full cops with empty tubes according to, for example, application Ser. No. 378,013, filed June 25, 1964, and especially for ring spinning or ring twisting machines with a drawing mechanism drawn forward to a point above the spindle row.

According to the principal application, the continuous removal of full cops on ring spinning or ring twisting machines is performed by means of a doffer which can travel along the machine on guide rails at constant speed and which is provided with a container for the full cops, the full cops being seized by a gripper at their upper extremity and removed vertically upward in the direction of the spindle axis. In order to achieve a vertical removal of the cop in spite of the continual advancement of the doffer along the machine without the action of harmful transverse forces on the spindle, the doffer is given an additional movement contrary to the direction of travel of the carriage, so that the gripper stands still relative to the spindle during the removal. This doffing motion may be only, and in such cases is not, applicable to ring spinning machines having a feed cylinder or loading arm, as the case may be, drawn forward to a point above the spindles, since the gripper which lifts the full cop will collide with the projecting parts of the drawing mechanism in its upward movement in the plane of the spindle. The problem is therefore to invent an apparatus which will make it possible to automatically remove full cops even on ring

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spinning machines with a drawing mechanism extending over the spindles.

This problem is solved according to the invention in that the gripper for seizing the full cops is mounted so as to be movable perpendicularly to the plane of the spindles, and driving means are provided which impart an additional movement to the gripper during its doffing movement, so that, making use of the conicity of the tube, the gripper carries the upper part of the cop out from under the drawing mechanism delivery cylinder, while the bottom end of the cop follows a vertical path in the area of the spindle. For this purpose the gripper is mounted in a quadrilateral bell-crank linkage on a gripper bearing, and both the gripper and the gripper bearing are connected each to a crank mechanism, the two crank mechanisms producing different stroke heights at the same moment during the doffing movement of the gripper. To achieve a set stroke height ratio during a certain period of time, the one crank mechanism has an appropriately shaped slide guide. The gripper can be given its additional movement also by a curved guiding track which it follows in its doffing movements. Also, the gripper can be mounted so as to be horizontally displaceable on the gripper bearing.

Further details of the invention will now be described with the aid of the drawings.

FIG. 1 is a diagrammatic representation of the manner in which the gripper is driven by two crank mechanisms, one operating position being indicated in phantom;

FIG. 2 shows the path of movement of the gripper at its front end;

FIG. 3 shows a variant in which the gripper is controlled by a curving track; and

FIG. 4 shows an embodiment like in FIG. 1, but with a gripper mounted so as to be displaceable horizontally, one operating position being indicated in phantom.

FIG. 1 shows a gripper 7 with seizing element 8, of a cop doffing apparatus which operates on the principle described in Ser. No. 378,013, and in which the doffing movement of the gripper 7 is produced by a crank mechanism. The crank mechanism for producing the vertical doffing movement of gripper 7 is composed of the crankshaft 16 and the crank arm 15 on which a crank pin 14 for connecting rod 13 is disposed. Connecting rod 13 is connected at its other end to a crosshead 12 by which a supporting tube 11 is pushed axially up and down by the reciprocating movement of the connecting rod 13. Supporting tube 11 is rotatably mounted in crosshead 12 and bears at its upper extremity a gripper bearing 2 on which the gripper 7 is movably disposed. Gripper 7 is connected to gripper bearing 2 by means of a quadrilateral bell-crank linkage consisting of the pivot points 22, 23, 24, and 25, points 22 and 23 being disposed on gripper bearing 2 and points 24 and 25 being disposed on gripper 7. Pivot points 23 and 25 are connected to one another by a link 28 that is rotatable on these points, and pivot points 22 and 24 are connected to one another by a triangular link 27 which is again rotatable on these points, so that gripper 7 can swing at point 24 about pivot point 22 and at point 25 about pivot point 23.

Whereas the crank pin 14 describes a circle with the radius r_1 on crank 15 for the doffing movement of gripper 7, a second pin 6 is so disposed on said arm 15 so that it describes with said arm a circle with the radius r_2 . On the pin 6, there is rotatably mounted a slide block 61 which is moved back and forth in a slide guide 9 as a result of the circular movement of pin 6. Slide guide 9 is fixedly attached to a pull rod 91 which is displaceably mounted in the supporting tube 11, so that both parts follow the up and down movement in the direction of the axis of pull rod 91, which is produced by the crank arm 15. Reciprocation of pull rod 91 is indicated by the arrow 91', reciprocation of supporting tube 11 is indicated

by arrow 11'. Owing to the fact that the one crank mechanism has a crank radius r_1 and the other crank mechanism has a crank radius r_2 , different stroke heights are produced.

In the bottom dead position of crank arm 15, that is, before the commencement of the doffing movement of gripper 7, the upper end of the supporting tube 11, which opens into the gripper bearing 2, and the upper end of pull rod 91, which is connected by a link 26 to the triangular link 27, coincide with one another. However, due to the rotation of the crank arm 15, the crank in 14 reaches a greater height than pin 6, the two stroke heights achieving at the top dead point a maximum difference of $2 \times (r_1 \text{ minus } r_2)$, i.e., the stroke height of the gripper bearing 2 differs by this amount from the upper end of the pull rod 91, so that pull rod 91 pulls link 26 downward and triangular link 27 is pivoted about pivot point 22. At the same time, pivot point 25, which is fastened to gripper 7, is thereby caused to pivot together with gripper 7 about pivot point 23 into the position indicated by broken lines. The result is that the seizing element 8 disposed at the extremity of gripper 7 performs a movement in the direction of the arrow Z in addition to the vertical doffing movement.

The manner in which the additional movement is to be superimposed upon the doffing movement, and the time at which it is to be so superimposed, is determined by the shape of the slide guide 9 in such a manner that a positive adaptation to the taper of the cop tube is produced. The slide guide 9 can thus be made straight or arcuate in shape, or of any other appropriate shape.

In FIG. 2, curve K represents the course of the doffing movement plus the additional movement. The cop 32 is seized by the seizing element 8 of gripper 7 and is first pulled upward from point K1 to point K2. As soon as the cop has enough room due to the taper in the cop tube, the additional movement of gripper 7 commences at point K2, the gripper moving upward while at the same time drawing back out of the plane of the spindle. The upper end of the cop is in the meantime rigidly held by the seizing element, so that the upper part of the cop together with gripper 7 is lifted away from the spindles perpendicularly to the spindle plane, past the projecting loading arm 30 of the drawing mechanism, while the bottom end of the cop is still following the perpendicular in the area of the spindle. The downward movement of gripper 7 after the ejection of the full cop is performed in the reverse manner.

Whereas in the construction shown in FIG. 1, the withdrawn cop 32 is guided positively in every respect, the bottom end of the cop can also be guided by the spindle in the embodiment shown in FIG. 4. Gripper 7 is mounted on the gripper bearing 2' so as to be horizontally displaceable in a slideway 71. By the pull of the pull rod 91, which is articulated at point 42 on an eccentric 33 mounted on the gripper bearing 2', the said eccentric is rocked and, due to its eccentricity, the gripper 7 is displaced horizontally in the direction of the arrow Z', against the pull of a spring 34. The upper end of the cop, which is articulately held by the seizing element 8, is thus likewise carried past the projecting loading arm 30 of the drawing mechanism in accord with the curve K represented in FIG. 2, while the bottom end of the cop follows the spindle. Instead of an eccentric 33, the displacement of the gripper 7 can also be provided for by a corresponding wedge which follows the movement of the pull rod 91 and thereby pushes gripper 7 away against the pull of the spring 34.

According to a variant of the invention (FIG. 3), the additional movement of gripper 7 is produced, not by an additional crank mechanism, but by a guiding curve 43 which gripper 7 follows in its doffing motion. In this case a roller 44 mounted on gripper 7 rolls in the guiding curve 43 which is in the form of a track. To enable gripper 7 to follow the guiding curve 43, the supporting

tube 11 which transmits the raising and lowering movement from the crank drive r_1 , is mounted pivotingly. The seizing element 8, as in the embodiment shown in FIG. 1, can guide the upper end of the cop fixedly, so that the upper end of the cop is obliged to follow the vertical in the area of the spindle.

An advantageous improvement of the apparatus according to the invention can furthermore be achieved by having the supporting tube 11 follow only the raising and lowering movement provided by the crank mechanism r_1 , while gripper 7 is mounted, as in FIG. 4, in a guide 71 on the gripper bearing 2' and is horizontally displaced by the guiding curve 43.

The construction shown in FIG. 1 hereof can be compared with the construction shown in FIG. 2 of Ser. No. 378,013. Thus, the construction in FIG. 1 is obtained by mounting the slide guide 9 of FIG. 1 hereof on the bottom of the supporting tube 11 of 378,013, and modifying the construction of the copending application to provide the pull rod 91 and quadrilateral bell-crank linkage mounting of the gripper 7.

In the embodiment shown in FIG. 4, the mounting of the gripper 7 on the bearing plate 2', by slideway 71, can be, for example, a dovetail tongue and groove interconnection between the gripper 7 and the bearing plate 2', wherein the tongue and groove construction permits the desired sliding movement, and at the same time restrains the gripper 7 from moving vertically on the bearing plate 2'.

Thus, the invention provides apparatus for use in lifting a cop off an upright spindle of a coping machine, wherein there is a taper between the spindle and cop which permits lifting of the cop off the spindle. The invention is particularly concerned with coping machines having auxiliary means for operation thereof, disposed over the spindle in the path of a cop lifted off the spindle along an extension of the axis of the spindle. The apparatus comprises a carriage, means for moving the carriage over the path past the spindle at a constant speed with respect to the spindle, and cop moving means movably mounted on the carriage for lifting the cop as the carriage passes the spindle. The cop moving means includes an engaging member for engaging the top portion of the cop, and means are provided for moving the cop moving means relative to the carriage to impart to the engaging member movement thereof opposite the movement of the carriage to substantially eliminate relative movement of the engaging means and the spindle in the direction of movement of the carriage. The invention provides the improvement of means for moving the cop moving means outwardly from the coping machine as the cop moving means lifts the cop from the spindle for travel of the cop moving means and a cop lifted thereby along a path avoiding interference with the auxiliary means of the coping machine disposed over the spindle. Movement of the cop on the spindle corresponding to the outward movement of the cop moving means is permitted by the taper relationship.

In the embodiment shown in FIG. 1 and FIG. 4, the cop moving means, in the form of the gripper 7, is movably mounted on a supporting member 11 by means permitting articulation of the gripper to provide the outward movement. Crank means for vertically reciprocating the support to vertically reciprocate the gripper for lifting of the cop are provided. Further, there is provided auxiliary connecting means interconnecting the crank means with the gripper for articulation of the gripper in coordination with the reciprocation thereof to provide the desired outward travel of the gripper. The mounting of the gripper on the support can be a quadrilateral articulation mounting (FIG. 1), or a slide mounting (FIG. 4).

In another embodiment (FIG. 3) the means for moving the cop moving means outwardly can be a roller mounted on the cop moving means, and the apparatus can include a curved track for the roller for guiding the cop

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moving means outwardly during the lifting of the cop moving means.

What is claimed is:

1. In apparatus for use in lifting a cop off an upright spindle of a copping machine, there being a taper between the spindle and cop permitting lifting of the cop off the spindle, and auxiliary means for operating the copping machine disposed over the spindle in the path of a cop lifted off the spindle along an extension of the axis of the spindle, said apparatus comprising a carriage, means for moving the carriage over a path going past the spindle at a constant speed with respect to the spindle, cop moving means movably mounted on the carriage for lifting the cop as the carriage passes the spindle, said cop moving means including an engaging member for engaging the top portion of the cop, and means for moving the cop moving means relative to the carriage to impart to the engaging member movement thereof opposite the movement of the carriage to substantially eliminate relative movement of the engaging means and the spindle in the direction of movement of the carriage, during said manipulation, the improvement which comprises: means for moving the cop moving means outwardly from the copping machine as the cop moving means lifts the cop from the spindle for travel of the cop moving means and a cop lifted thereby along a path avoiding interference with said auxiliary means, movement of the cop on the spindle corresponding to the outward movement of the cop moving means being permitted by the said taper.

2. Apparatus according to claim 1, wherein the cop moving means is movably mounted on a supporting member by means permitting articulation of the cop moving means providing said outward movement, crank means for vertically reciprocating said support to vertically reciprocate the cop moving means for lifting of the cop thereby during upward travel of said reciprocation, auxiliary connecting means interconnecting said crank means with the cop moving means for articulation of the cop moving means in coordination with the reciprocation thereof to provide said avoidance of interference.

3. Apparatus according to claim 2, the mounting of the cop moving means and on the supporting member being a quadrilateral articulation mounting.

4. Apparatus according to claim 2, the auxiliary con-

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necting means comprising a push rod disposed coaxially with respect to the support, a push rod drive linkage connecting one end of the push rod with said crank means for reciprocation of the push rod by the crank means, said reciprocation of the push rod being in relation to reciprocation of the support means by the crank means providing relative movement of the push rod and support, and means connecting the other end of push rod with the cop moving means for said articulation of the cop moving means in response to said relative movement of the push rod and support.

5. Apparatus according to claim 4, the push rod drive linkage comprising a slideway mounted on the push rod, a slide block slidably mounted in said slideway, said crank means comprising a rotatably mounted drive shaft, a crank arm mounted on said drive shaft and a connecting rod interconnecting the outer end portion of the crank arm with the support for reciprocation of the support by the crank means, and a connecting pin interconnecting the slide block and the crank arm at a point radially spaced from the connection of the crank arm and connecting rod, whereby the crank means drives the push rod providing said relative reciprocation.

6. Apparatus according to claim 5, said point radially spaced from the connection of the crank arm and connecting rod being radially inwardly of crank arm-connecting rod connection.

7. Apparatus according to claim 2, the cop moving means being slidably mounted on the support for permitting said outward movement of the cop moving means in response to operation of the auxiliary drive means.

8. Apparatus according to claim 1, said means for moving the cop moving means outwardly comprising a roller mounted on the cop moving means, and a curved track for the roller for guiding the cop moving means outwardly during lifting of the cop moving means.

References Cited

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JOHN PETRAKES, *Primary Examiner*.