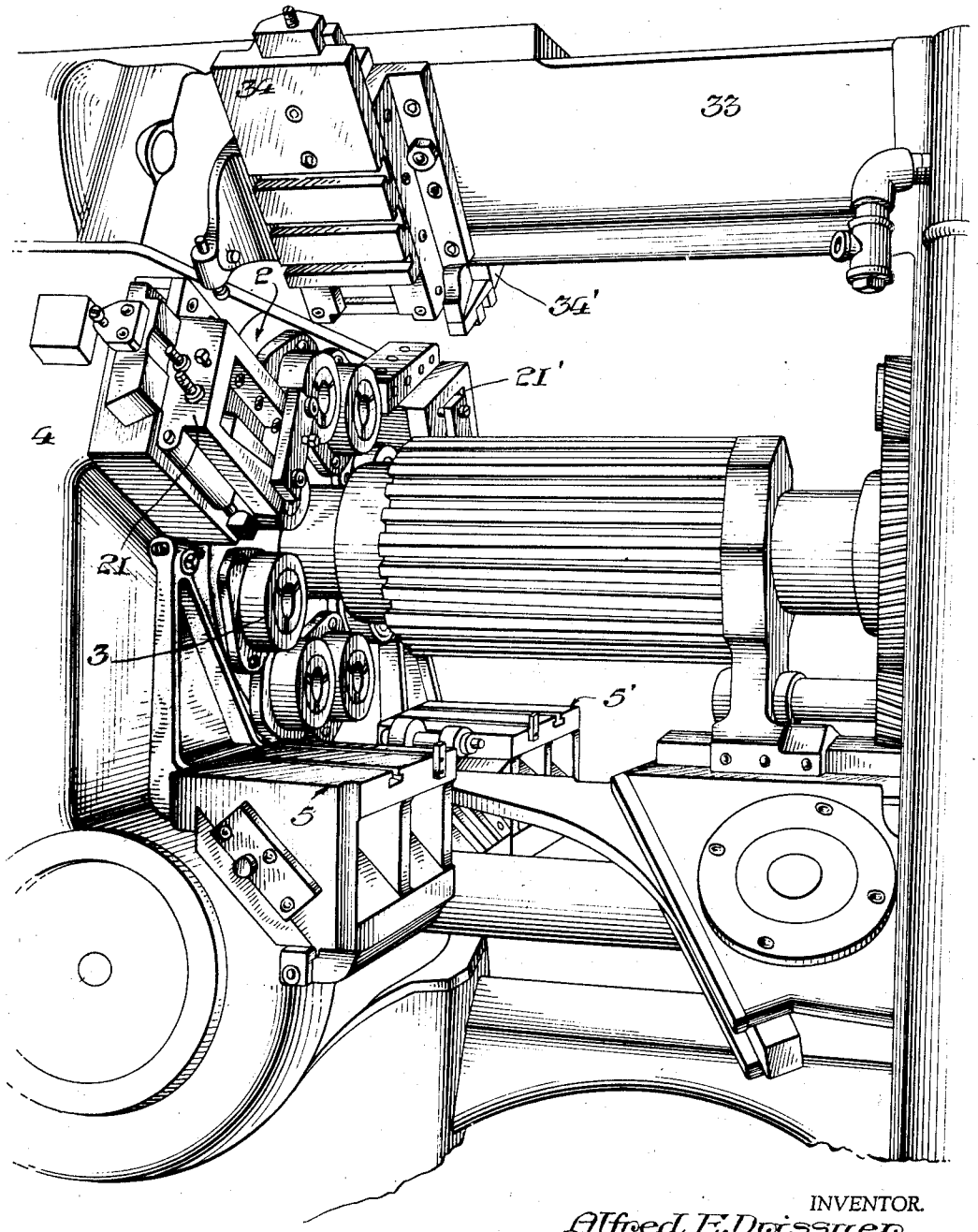
Jan. 16, 1940. A. E. DRISSNER 2,187,683

INDEPENDENT CROSS SLIDE MECHANISM

Filed May 17, 1939 3 Sheets-Sheet 1

Fig. 1.



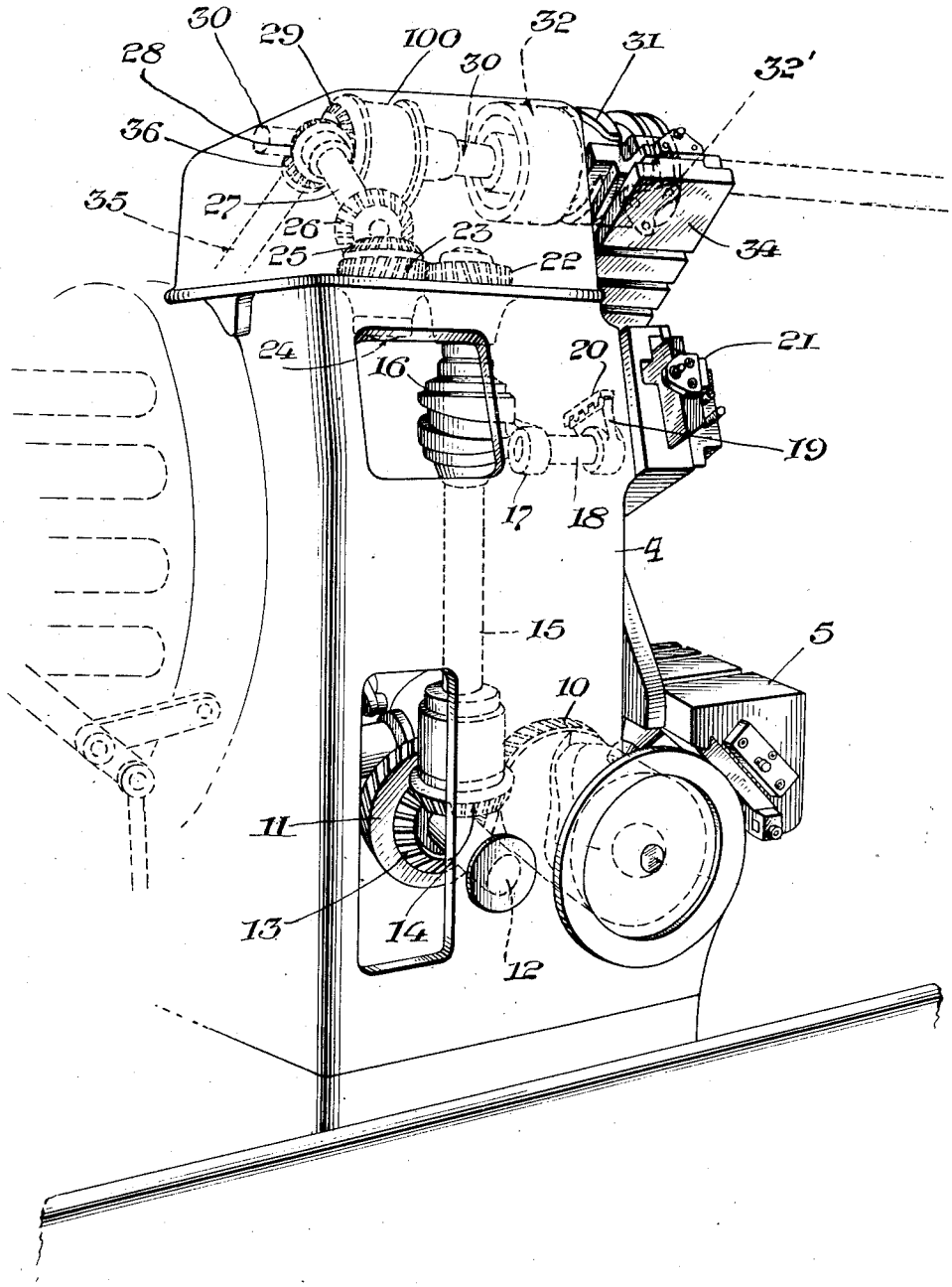
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INDEPENDENT CROSS SLIDE MECHANISM

Filed May 17, 1939 3 Sheets-Sheet 2

Fig. 2.



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INDEPENDENT CROSS SLIDE MECHANISM

Filed May 17, 1939 3 Sheets-Sheet 3

Fig. 3.

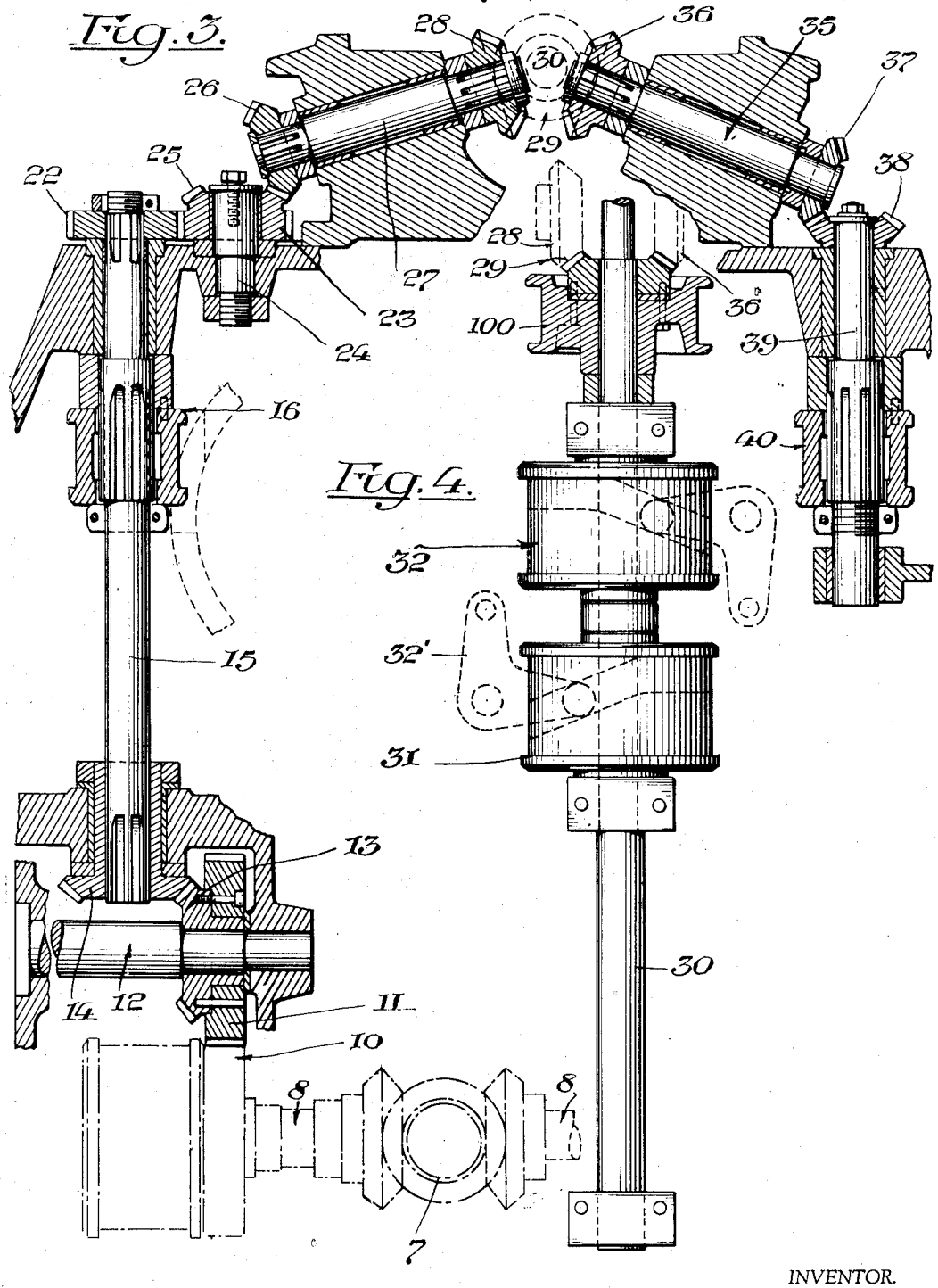


Fig. 4.

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UNITED STATES PATENT OFFICE

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INDEPENDENT CROSS SLIDE MECHANISM

Alfred E. Drissner, Cleveland, Ohio, assignor to The National Acme Company, Cleveland, Ohio, a corporation of Ohio

Application May 17, 1939, Serial No. 274,127

29 Claims. (Cl. 29—37)

This invention relates to forming or cross slide mechanism for automatic metal working machines of the multiple spindle type such as six or eight spindle machines, the object of the invention being to provide a series of cross slides comprising a pair of cross slides for a lower pair of spindles, a pair of cross slides for an upper pair of spindles, and a pair of cross slides for an intermediate pair of spindles of, for instance, a six spindle machine and which lower cross slides may carry superposed or double deck cross slides for the other pair of spindles when the spindle carrier is provided with eight rotary spindles and which cross or side slides are all operated independently of each other so that the exact depth of forming, cutting off and other operations may be performed by the tools carried by these slides, thereby accomplishing greater production, prolonging the life of the tools and attaining increased accuracy.

The present invention is an improvement upon that shown and described in my contemporaneously pending application, Serial Number 163,728, filed September 14, 1937, the improvement having to do primarily with cross slide operating mechanism consisting of operating shafts, intermeshing gears and cams carried by the shafts, thereby doing away with the use of levers and links as in the prior case referred to, and locating this operating mechanism interiorly of the spindle carrier housing instead of exteriorly of the housing as in the previous application.

Prior to the application above referred to, it has been the practice to provide multiple spindle machines with side forming or cross slides for operation upon the work of the two lower spindles and top forming or cross slides for operation upon the work of the two upper spindles and, in a six spindle machine, to provide for operation upon the two intermediate spindles, commonly designated as the 2nd and 5th positions of the spindles, double deck tool holders or slides whereby two of the tool holders cooperate with the two lower spindles, commonly designated as the 1st and 6th position spindles and the other two cooperate with the two intermediate spindles designated, as stated, as the 2nd and 5th position spindles.

However, as both double deck tool holders at each side of the machine were operated by the same means, it followed that the travel and retraction of the tool holders at each side was the same since the tools of both double deck slides moved together at the same speed. Consequently, there were certain disadvantages and inaccuracies resulting and the production of the work was lessened.

In the patent of Simpson and Drissner, No. 2,033,490, of March 10, 1936, instead of providing double deck side tool holders, side tool holders for the intermediate or 2nd and 5th position spindles were provided, carried by levers which also operated the top cross slides but here, again, the side slides and top slides were operated by the same means and the same disadvantages were present.

To eliminate these disadvantages and provide a multiple spindle machine of the six spindle type with an independent cross slide for each spindle, whereby each tool could have its own independent travel and thus have the advantage of exact depth of forming, cutting-off or any other operation performed by the side tool slide and thereby increased production of the machine and insuring greater accuracy together with a much more efficient operating mechanism located interiorly of the spindle carrier housing is the object of the present improvement.

Among the advantages of the particular lower side slides is (1) the shortest possible leverage between drum, cam and roll contact to the center of the slides; (2) heavier and wider slides and tool holders with consequent finer accuracy up to the safe limit of tool feeds; (3) more chip clearance; (4) greater operating convenience through increased accessibility to tools and work.

The two upper side slides, commonly called top slides, adjacent to the 4th and 5th spindle positions of an eight-spindle machine, are mounted on the heavy top brace. Each slide is independently controlled from its horizontal drum in the top brace, driven through gears and a vertical shaft from the lower cross slide drum shaft on the front side of the machine. This especially rigid top slide construction makes practicable the application of heavy tool holders in the two top spindle positions as well as on the lower side slides, with the insurance of accuracy on wide and deep forming cuts.

The two intermediate centrally located side slides on the face of the headstock housing are adjacent to the 3rd and 6th spindle positions and these intermediate slides are each independently controlled by vertically mounted cam drums located on upright shafts and driven from the lower side slide drum shaft on the front side of the machine. These 3rd and 6th position side slides permit many operations such as finish forming, form turning, recessing, knurling, etc. They provide for widely diversified side tooling

operations in keeping with the increased number and styles of end working tools made possible by an eight spindle design with resulting savings in the production time and finer finish, depending upon the class of work.

An important advantage in the present improvement is that the cam shaft at the bottom of the machine controls the cam shaft at the top as distinguished from the machines of the prior art in which the cam shaft is located at the top of the machine only and among the advantages of this present improvement is that the operating means for the cross slides is very close to the slides themselves and eliminates link means, levers, arms and any intermediate mechanism reaching from the bottom to the top so that the tool slides are operated directly from a drum and cam located immediately behind the slide or underneath the same, thereby insuring greater accuracy, eliminating spring action and, therefore, giving longer life to the cutting tools.

Thus, the present improvement provides a series of independently operated side or cross tool slides at each side of the machine operated by a positive mechanism which eliminates the use of levers, links, arms and other similar operating means and locates such operating means entirely within the spindle carrier housing where it is protected from dust, dirt and chips, insuring greater accuracy and efficiency since, while the top cam drum shaft will rotate at the same R. P. M. as the lower cam drum shaft and while all the tool slide cams are the same length and degree so that all tools may start and finish at the same time, yet, if the set-up requires that any slide finish sooner than the others, this is easily accomplished by the use of shorter cams and is an important feature which cannot be accomplished with slides not independent of each other so that the main feature is the independent tool adjustment by reason of the fact that each tool has its independent cam.

In the drawings accompanying and forming a part of this specification, Fig. 1 is a front perspective view of the present improvement.

Fig. 2 is a side view thereof.

Fig. 3 is a partly sectional view illustrating the side slide operating mechanism, and

Fig. 4 is a partly sectional view of the top cam drum shaft.

Similar characters of reference indicate corresponding parts in the several views.

Before explaining in detail the present improvement and mode of operation thereof, I desire to have it understood that the invention is not limited to the details of construction and arrangement of parts illustrated in the accompanying drawings since the invention is capable of other embodiments, and that the phraseology employed is for the purpose of description and not of limitation.

The present invention, being an improvement upon that shown and described in the patent and application hereinbefore referred to, only so much of that machine is illustrated as is deemed necessary to an understanding of the present construction. Therefore, the spindle carrier **2**, shown in the present instance as having eight rotary work carrying spindles **3**, is mounted in an upright housing **4**.

The two lower cross slides **5** and **5'** for the two lower spindles, or the 1st and 8th position in an eight spindle machine, are constructed similar to that described in my prior application, Serial Number 162,846, filed September 8th, 1937, and, therefore, a detailed description thereof is unnecessary herein, it being sufficient to say that they are shown as supported by angular or inclined means so that the axis of the cam drums for operating these slides, instead of being directly under and in alignment with the longitudinal axis of the slides, is located rearwardly of or side-wise to the axis and at the inner sides of the slides, thus materially increasing the chip room between the housings and permitting the use of much wider slides, these slides being located at the front of the gear housing, one at each side thereof, and these lower cross slides for the lower spindles are operated by cam drums hereinafter described, the formation of the cams on these drums controlling the operation of the bottom slides, the right hand side drum shaft controlling independently the travel of the other slides hereinafter referred to, considering the side shown in Fig. 2 as the right hand side when viewed from the rear of the spindle carrier.

To increase production of the machine and accuracy of the work as well as prolonging the life of the tool in the modern high speed machines, it has become essential not merely to provide side forming tools that will cooperate with the intermediate spindles but to operate these cross slides and their tools entirely independently of the lower side and top slides and this has necessitated not only additional mechanism but a location thereof so as not to interfere with the operation of the other parts and the compactness of the machine and, in the present improvement, this mechanism is located within the gear housing and comprises a series of intermeshing gears and shafts.

Therefore, the gist of the present improvement is the provision of independently operated and controlled side forming or cross tool slides, at least three at each side of the machine, which will not interfere with the work of any other side tool, each having its own independent operating means and, therefore, travel, whereby one can travel a greater or less distance than the other two.

For operating the intermediate slides and their companion slides, the lower shaft **7**, commonly designated as the main cam shaft, drives a pair of gears mounted on cross shafts **8** carrying a cam drum at each end, the cam of each of which cooperates with the cam roller carried by each lower slide, thereby shifting them back and forth simultaneously toward and from the two lower work spindles.

Carried by one cross shaft **8** is a spirally formed gear **10** meshing with a similar gear **11** on a stationary stub shaft **12**, this gear **11** being provided with a bevel gear **13** rotating therewith and meshing with a similar bevel gear **14** secured to the lower end of an upright or vertically located shaft **15** which, near its upper end, carries a cam drum **16** for driving a roll carrying cam lever **17** of a short shaft **18** having a segmental gear **19** meshing with a rack **20** connected with the right hand intermediate cross slide **21** whereby this is shifted toward and from its work spindle.

Located at the upper end of this upright shaft **15** is a spiral gear **22** meshing with a similar gear **23** loosely mounted on the stud **24** and this gear **23** has as one unit therewith, a bevel gear **25** meshing with a similar gear **26** secured to an angle or inclined shaft **27**, the opposite end of which is provided with a bevel gear **28** meshing with a similar bevel gear **29** on a top shaft **30** directly

in line with the lower main cam shaft hereinbefore referred to and which carries a cam drum 100 provided for operating the spindle carrier locking mechanism. This shaft also carries a pair of cam drums 31 and 32, one of which, as 31, by means of a suitable angle lever 32' and coacting means, operates the right hand top slide 34 mounted on the top supporting triangular beam 33 which connects the spindle carrier housing with the gear housing at the opposite end of the machine, the left hand top slide 34' being located at the other side of this triangular beam and, as before stated, being operated by the other cam drum 32 just referred to. Suitable means is provided for adjusting these slides.

For operating the left hand intermediate slide 21' there is an inclined or angle shaft 35 having at its upper end a bevel gear 36 also meshing with the bevel gear 29 of the top shaft. The lower end of this inclined shaft is provided with a bevel gear 37 in mesh with the bevel gear 38 of the short vertical shaft 39 provided with a cam drum 40 similar to that mounted on the vertical shaft at the right hand side of the gear housing, and by means of which a rack and segmental gear similar to that hereinbefore described is operated, thereby operating the other intermediate slide 21' toward and from the work spindles. Suitable means is likewise provided for adjusting these slides and also the bottom slides.

By having this short shaft at the left hand side of the machine, space is provided for the spindle carrier locking and indexing mechanism.

From the foregoing, it will be seen that the two lower slides 5 and 5' are operated by cross shafts, deriving power from the main cam shaft extending lengthwise of the machine; that the intermediate cross slide 21 is operated by the vertical shaft at the right hand side of the machine and the intermediate cross slide 21' is operated by the short vertical shaft at the left hand side of the machine, both deriving their power from the long vertical shaft at the right hand side of the machine, and that the two top slides, in turn, are driven by the upper shaft also deriving its power from the long vertical shaft at the right hand side of the machine and all driven by the main shaft in the manner hereinbefore described, but that the mechanism is so arranged that each slide is independently operated, having its own independent operating means so that, as hereinbefore stated, by changing the cams, the several slides on each side of the machine may start and finish at different times, thus providing for an increased amount of work on the machine. Thus, it will be seen that the driving means for all of the side slides is so located that the various cams or cam drums thereof are driven in tandem or series and by simply changing or varying any or all of the cams, the feeds of the several slides may be readily changed.

It will be understood, of course, that the machine is provided with a main tool slide carrying the necessary tools for working on the ends of the work bars fed through the rotatable spindles of the indexable spindle carrier.

In the present improvement, where end working attachments or tools such as threading, reaming and turning or boring tools are carried by the top triangular beam, the upper shaft may be extended and by the provision of drums and cams thereon, utilized to operate these end working tools. This will enable a much more simple operating mechanism to be used for the various mechanisms referred to instead of operating them from the lower shaft as heretofore requiring complicated links and levers.

It is to be understood that, by describing in detail herein any particular form, structure or arrangement, it is not intended to limit the invention beyond the terms of the several claims or the requirements of the prior art.

Having thus explained the nature of my said invention and described a way of constructing and using the same, although without attempting to set forth all of the forms in which it may be made or all of the modes of its use, I claim:

1. A multiple spindle machine having a work spindle carrier, a housing for supporting the same, a top tool slide for an upper spindle, a lower side tool slide for a lower spindle, an intermediate side tool slide for an intermediate spindle, and means driven in tandem and located within said housing for operating each slide independently.

2. A multiple spindle machine having a work spindle carrier, a housing for supporting the same, a top tool slide for an upper spindle, a lower side tool slide for a lower spindle, an intermediate side tool slide for an intermediate spindle, and means driven in tandem and comprising a system of intermeshing gears and shafts for operating each slide independently.

3. A multiple spindle machine having a work spindle carrier, a housing for supporting the same, a top tool slide for an upper spindle, a lower side tool slide for a lower spindle, an intermediate side tool slide for an intermediate spindle, and means driven in tandem and comprising a system of intermeshing gears and shafts for operating each slide independently and all located within the gear housing.

4. A multiple spindle machine having a work spindle carrier, a housing for supporting the same, top tool slides for upper spindles, lower tool slides for lower spindles, intermediate side tool slides for intermediate spindles, and means driven in tandem and located within said housing for operating each pair of slides independently.

5. A multiple spindle machine having a work spindle carrier, a housing for supporting the same, top tool slides for upper spindles, lower tool slides for lower spindles, intermediate side tool slides for intermediate spindles, and means driven in tandem and comprising a system of intermeshing gears and shafts for operating each pair of slides independently.

6. A multiple spindle machine having a work spindle carrier, a housing for supporting the same, top tool slides for upper spindles, lower tool slides for lower spindles, intermediate side tool slides for intermediate spindles, and means driven in tandem and comprising a system of intermeshing gears and shafts for operating each pair of slides independently and all located within the gear housing.

7. A multiple spindle machine having a work spindle carrier, a housing for supporting the same, a lower shaft, a pair of top tool slides for upper spindles, a pair of lower tool slides for lower spindles, a pair of intermediate tool slides for intermediate spindles, a pair of drum carrying cross shafts for operating the lower slides, an upright shaft operated by one of said cross shafts, a cam drum thereon for operating an intermediate slide, gearing and a pair of cross shafts operated from said upright shaft, a top shaft operated from one of said cross shafts and operating the other, cam drums on the top shaft for operating the top slides, a short shaft oper-

ated by one of said last cross shafts, a cam drum thereon, and means operated thereby for operating the other intermediate slide.

8. A multiple spindle machine having a work spindle carrier, a housing for supporting the same, a lower shaft, a pair of top tool slides for upper spindles, a pair of lower tool slides for lower spindles, a pair of intermediate tool slides for intermediate spindles, a pair of drum carrying cross shafts for operating the lower slides, an upright shaft operated by one of said cross shafts, a cam drum thereon for operating an intermediate slide, gearing and a pair of cross shafts operated from said upright shaft, a top shaft operated from one of said cross shafts and operating the other, cam drums on the top shaft for operating the top slides, a short shaft operated by one of said last cross shafts, a cam drum thereon, and means operated thereby for operating the other intermediate slide, the major portion of which is located within said housing.

9. A multiple spindle machine having a work spindle carrier, a housing for supporting the same, a lower shaft, a pair of top tool slides for upper spindles, a pair of lower tool slides for lower spindles, a pair of intermediate tool slides for intermediate spindles, a pair of drum carrying cross shafts for operating the lower slides, an upright shaft operated by one of said cross shafts, a cam drum thereon for operating an intermediate slide, gearing and a pair of cross shafts operated from said upright shaft, a top shaft operated from one of said cross shafts and operating the other, cam drums on the top shaft for operating the top slides, a short shaft operated by one of said last cross shafts, a cam drum thereon, means operated thereby for operating the other intermediate slide, and means on the top shaft for controlling the locking mechanism of the spindle carrier.

10. A multiple spindle machine having a work spindle carrier, a housing for supporting the same, a lower shaft, a pair of top tool slides for upper spindles, a pair of lower tool slides for lower spindles, a pair of intermediate tool slides for intermediate spindles, a pair of drum carrying cross shafts for operating the lower slides, an upright shaft operated by one of said cross shafts, a cam drum thereon for operating an intermediate slide, gearing and a pair of cross shafts operated from said upright shaft, a top shaft operated from one of said cross shafts and operating the other, cam drums on the top shaft for operating the top slides, a short shaft operated by one of said last cross shafts, a cam drum thereon, and means operated thereby for operating the other intermediate slide, said top shaft being extensible for carrying mechanism for operating the tools of end working tool attachments.

11. A multiple spindle machine having a work spindle carrier, a housing for supporting the same, a pair of angularly supported lower tool slides for lower spindles, a pair of angularly supported tool slides for upper spindles, a pair of angularly supported intermediate side tool slides for intermediate spindles, and means driven in tandem for independently operating the pairs of slides.

12. A multiple spindle machine having a work spindle carrier, a housing for supporting the same, a pair of angularly supported lower tool slides for lower spindles, a pair of angularly supported tool slides for upper spindles, a pair of angularly supported intermediate side tool slides for intermediate spindles, and means driven in tandem for indepently operating the pairs of slides, said means being located within the housing.

13. A multiple spindle machine having a work spindle carrier, a housing for supporting the same, a pair of angularly supported lower tool slides for lower spindles, a pair of angularly supported tool slides for upper spindles, a pair of angularly supported intermediate side tool slides for intermediate spindles, and means driven in tandem for independently operating the pairs of slides and comprising shaft and gear mechanism.

14. A multiple spindle machine having a work spindle carrier, a housing for supporting the same, a pair of angularly supported lower tool slides for lower spindles, a pair of angularly supported tool slides for upper spindles, a pair of angularly supported intermediate side tool slides for intermediate spindles, and means driven in tandem for independently operating the pairs of slides and comprising shaft and gear mechanism, the major portion of which is located within the housing.

15. A multiple spindle machine having a work spindle carrier, a housing for supporting the same, a triangular top beam extending therefrom, a pair of top tool slides carried by said beam for the upper spindles, a pair of lower tool slides for the lower spindles and located in front of said housing, a pair of intermediate tool slides for the intermediate spindles and carried by the front of said housing, and means for independently operating said pairs of slides.

16. A multiple spindle machine having a work spindle carrier, a housing for supporting the same, a triangular top beam extending therefrom, a pair of top tool slides carried by said beam for the upper spindles, a pair of lower tool slides for the lower spindles and located in front of said housing, a pair of intermediate tool slides for the intermediate spindles and carried by the front of said housing, and means for independently operating said pairs of slides, said means comprising a system of intermeshing gears and shafts for operating each pair of slides.

17. A multiple spindle machine having a work spindle carrier, a housing for supporting the same, a triangular top beam extending therefrom, a pair of top tool slides carried by said beam for the upper spindles, a pair of lower tool slides for the lower spindles and located in front of said housing, a pair of intermediate tool slides for the intermediate spindles and carried by the front of said housing, and means for independently operating said pairs of slides, said means comprising a system of intermeshing gears and shafts for operating each pair of slides and all located within the gear housing.

18. A multiple spindle machine having a work spindle carrier, a housing for supporting the same, top tool slides for upper spindles, a shaft and cam drums for operating said top tool slides, lower tool slides for lower spindles, shafts, and cam drums for operating said lower tool slides, intermediate side tool slides for intermediate spindles, shafts and cam drums for operating said intermediate slides, a main shaft, means for driving the shafts of the lower side slides, and means driven from one of said lower side slide shafts for driving the shafts of the intermediate and top slide operating shafts.

19. A multiple spindle machine having a work spindle carrier provided with upper, intermediate and lower work spindles, an angularly supported

top tool slide for the upper spindle, an angularly supported lower tool slide for the lower spindle, an angularly supported intermediate side tool slide for the intermediate spindle, and means for independently operating the slides, the angularity of the lower tool slide support extending transversely to that of the upper and intermediate tool slides.

20. A multiple spindle machine having a work spindle carrier provided with upper, intermediate and lower work spindles, an angularly supported top tool slide for the upper spindle, an angularly supported lower tool slide for the lower spindle, an angularly supported intermediate side tool slide for the intermediate spindle, and means for independently operating the slides, the angularity of the lower tool slide support extending transversely to that of the upper and intermediate tool slides with the lower slide movable in a horizontal plane.

21. A multiple spindle machine having a work spindle carrier provided with pairs of upper, lower and intermediate work spindles, a housing for supporting the same, a pair of angularly supported lower tool slides for the lower spindles, a pair of angularly supported tool slides for the upper spindles, a pair of angularly supported intermediate side tool slides for the intermediate spindles, and means for independently operating the pairs of slides and all located within the housing, the angularity of the lower tool slide supports being transverse to that of the top and intermediate side tool slides, with the lower tool slides movable in a horizontal plane.

22. The structure of claim 18 in which said last means includes a pair of upright shafts, one for each intermediate slide.

23. The structure of claim 18 in which said last means includes a pair of upright shafts, one for each intermediate slide and in which one of said upright shafts and means cooperating therewith drives the top slides.

24. The structure of claim 18 in which said last means includes a pair of upright shafts, one for each intermediate slide and in which one of said upright shafts and means cooperating therewith drives the top slides, and in which the cams of the several cam drums may be varied to change the feeds of the several slides.

25. The structure of claim 7 in which the cams of the several cam drums may be varied to change the feeds of the several slides.

26. A multiple spindle machine having a work spindle carrier, a housing for supporting the same, a top beam extending therefrom, a pair of top tool slides carried by said beam for the upper spindles, a pair of lower tool slides for the lower spindles, a pair of intermediate tool slides for the intermediate spindles, and means driven in tandem and comprising a main shaft and a system of cam carrying shafts including a pair of upright shafts and a top shaft located parallel to the main driving shaft for independently operating said slides.

27. A multiple spindle machine having a work spindle carrier having bottom, top and intermediate pairs of spindles, a housing for supporting the same, top tool side slides for the upper spindles, lower side tool slides for the lower spindles, intermediate side tool slides for the intermediate spindles, and cam means driven in tandem for operating all of the slides independently.

28. The structure of claim 27 in which the cams of the slides may be varied to effect independent feeds of the several slides.

29. The structure of claim 27 in which the tandem driven cam means are carried by gear operated shafts, some of which are located in endwise relation to one another.

ALFRED E. DRISSNER.