Nov. 23, 1943. J. H. MANSFIELD 2,334,830

MORTISING MACHINE

Original Filed Nov. 29, 1940 2 Sheets-Sheet 1

Fig. 1

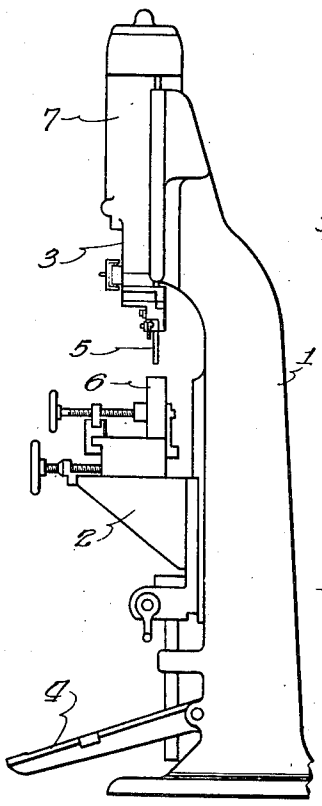


Fig. 2

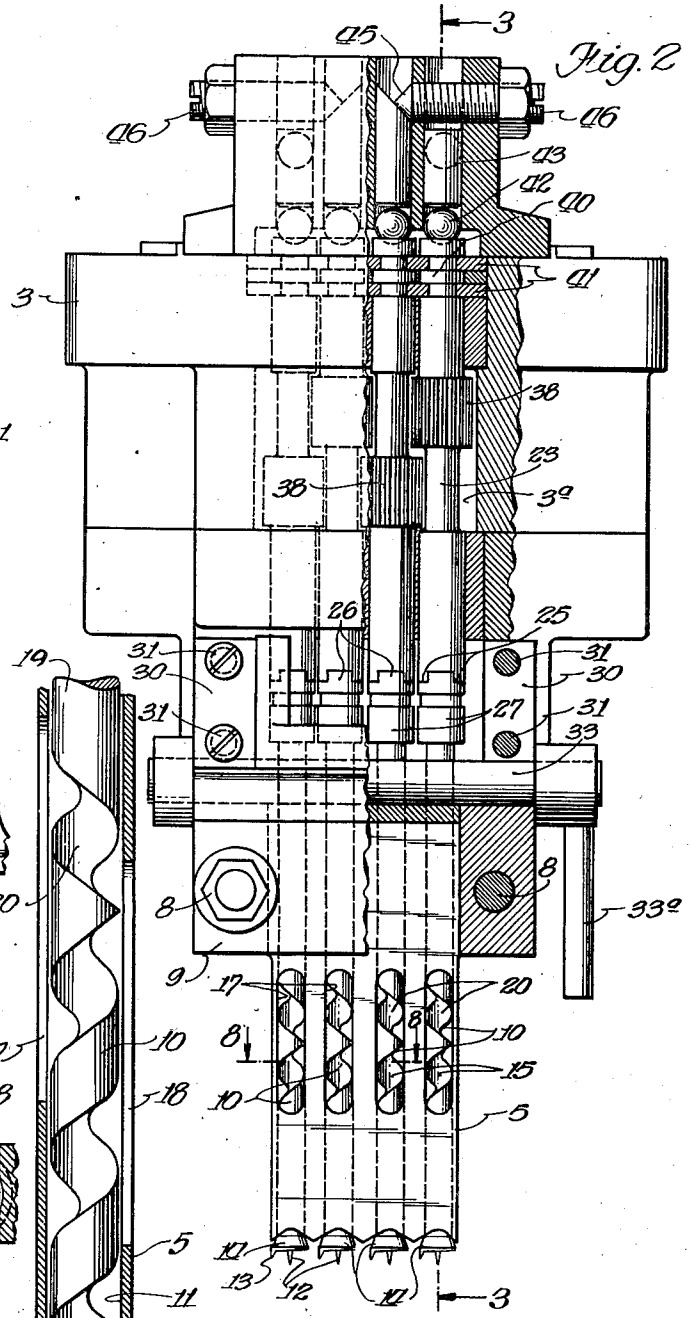


Fig. 7

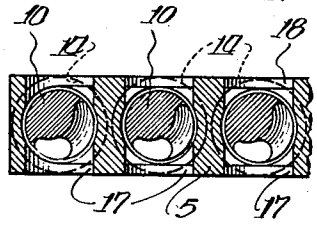


Fig. 8

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Fig. 4

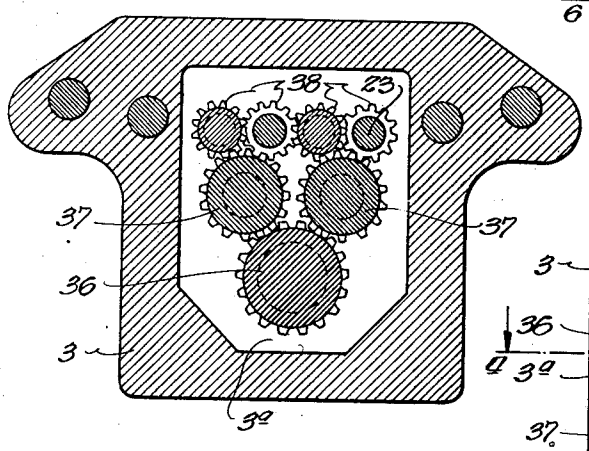


Fig. 5

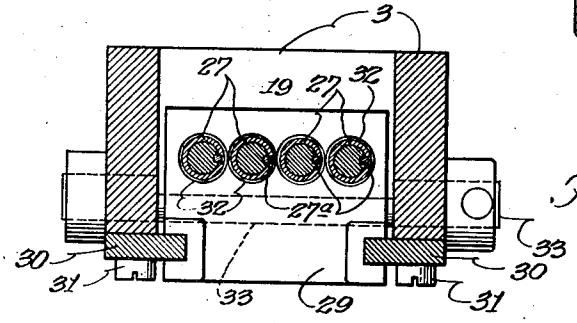


Fig. 6

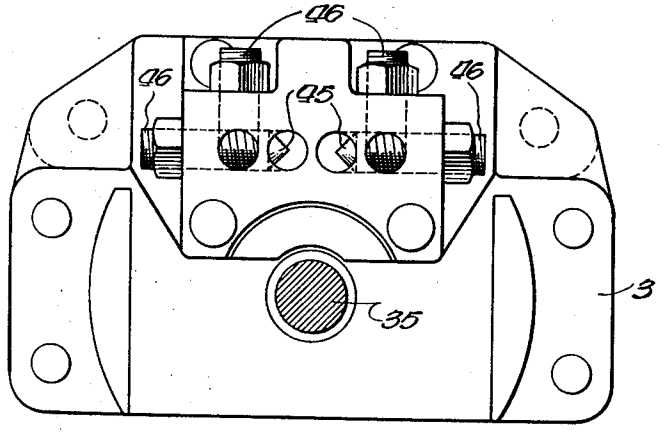
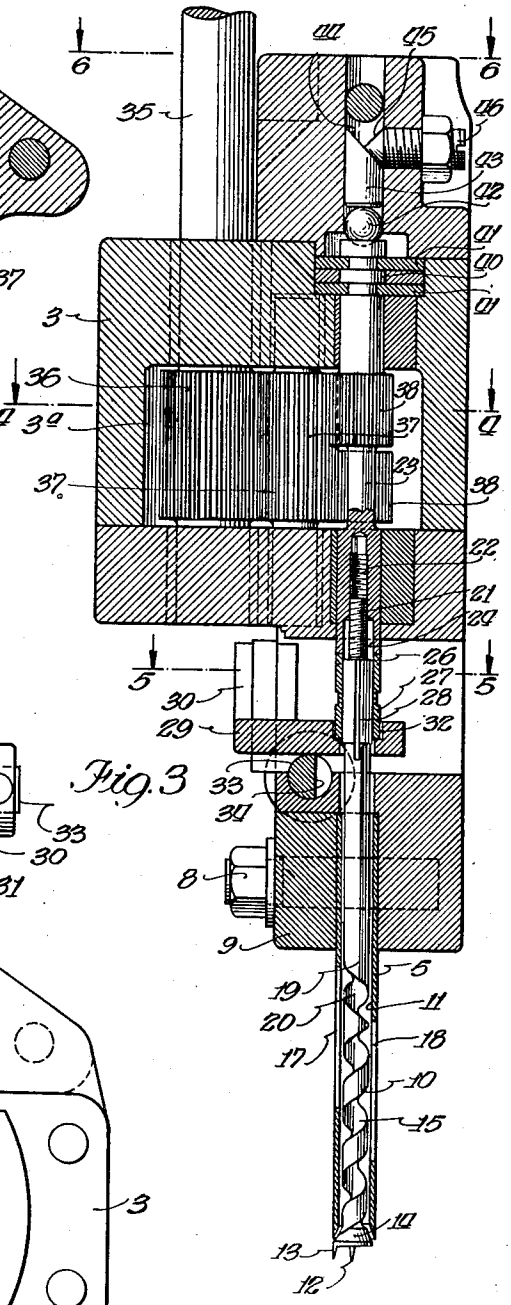


Fig. 3



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UNITED STATES PATENT OFFICE

2,334,830

MORTISING MACHINE

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Original application November 29, 1940, Serial No. 367,818. Divided and this application October 15, 1941, Serial No. 415,051

8 Claims. (Cl. 144—78)

This invention relates to multiple spindle machines and particularly to mortising machines of the type in which a hollow chisel member is supplemented by one or more auger bits rotatably mounted in the chisel for performing a substantial part of the removal of material in the mortising operation. This application is a division of my application Serial No. 367,818, filed November 29, 1940.

One object of the invention is to provide an improved mortising head and tool for a machine of this character in which a plurality of auger bits are rotatably associated with the chisel member.

Another object of the invention is to provide a driving train for a plurality of auger bits thus associated with a chisel member, said train being arranged to permit the auger bits to operate very close to each other upon parallel axes.

A further object is to provide for individual endwise adjustment of the bits in relation to the chisel member to compensate for wear and for the grinding back of the cutting edges of the chisel when it is sharpened.

It is also an object of the invention to provide clutch means for connecting the individual auger bits with the corresponding drive spindles, together with means for engaging or disengaging all the clutches simultaneously, particularly in connection with the endwise adjustment of the bits.

Other objects and advantages will appear from the following description taken in connection with the accompanying drawings, in which:

Fig. 1 is a side elevation of a mortising machine of the type to which this invention applies.

Fig. 2 is a front elevation partly in section, showing the tool head and mortising chisel, section being taken substantially at the plane of the axes of the auger bits and their drive shafts.

Fig. 3 is a vertical section taken principally as indicated at line 3—3 on Fig. 2.

Fig. 4 is a horizontal detail section taken as indicated at line 4—4 on Fig. 3.

Fig. 5 is a detail section taken as indicated at line 5—5 on Fig. 3.

Fig. 6 is a top plan view of the head shown in Figs. 2 and 3, as indicated at line 6—6 on Fig. 3.

Fig. 7 is an enlarged vertical section at the same plane as Fig. 3, showing one of the auger bits and adjacent portions of the chisel member.

Fig. 8 is a transverse section taken as indicated at line 8—8 on Fig. 2.

Although I have shown in the drawings, and shall herein describe in detail, a single form of the invention, I do not intend to limit the invention to the particular form shown, but aim to cover all modifications and alternative constructions coming within the scope of the claims.

The mortising machine illustrated generally in Fig. 1 includes an upright frame 1, having a work supporting table 2 and a head 3 slidably mounted in the frame for movement toward and from the table. By means of suitable linkage, not shown, housed within the frame 1, a treadle 4 is arranged to control this vertical movement of the head 3 for feeding the chisel member 5 into the work piece, indicated at 6, to form a mortise therein. It may be understood that the mortising tool is of the type which includes one or more auger bits rotatably carried within the tool for removing a substantial portion of the material in the process of forming a mortise. These bits are driven by means of a suitable electric motor enclosed within a housing 7 which surmounts the head 3, and is connected to move with it throughout its range of vertical adjustment in the frame 1.

The head 3 is shown on a larger scale in Figs. 2 and 3, which include also the chisel 5 of rectangular cross-section, having its upper end portion fitted into and securely clamped in the head by means of clamping nuts 8 which bear against a separable portion 9 at the lower end of the head 3. The chisel member 5 is provided with a plurality of auger bits 10 which, in the particular tool illustrated, are four in number and are rotatably mounted within parallel bores 11 in the body of the chisel member 5.

Each of the auger bits includes a pointed center 12 and a single spur or cutter 13 at its lower end, and the end portion 14 which carries the center 12 and cutter 13 is of slightly larger diameter than the bore 11 and is tapered back to its connection with the helically grooved body portion of the bit in which a helical groove 15 is formed for conveying the chips upwardly from the cutting end. The lower end of the bore 11 is slightly flared at 16 to accommodate the tapered end portion 14 of the bit, but suitable running clearance is provided between these tapered parts and also between the main body of the bit and the bore 11.

A slot 17 is formed in the front wall of the chisel member 5 opposite each of the bores 11, and similar slots 18 are formed in the back wall, also registering with the respective bores 11 so that as the auger bits 10 rotate, the chips carried upward by the helical conveyor grooves 15 may

be discharged from the interior of the chisel. Preferably, to avoid unduly weakening the chisel body through too great a portion of its length, the openings 17 and 18 are vertically offset with respect to each other, the openings 18 extending lower in the chisel body than the openings 17, and the openings 17 extending higher than the openings 18, as clearly seen in Fig. 7.

But in spite of the provision of the discharge slots 17 and 18 there is a tendency for some of the chips to continue upwardly in response to the conveyor feed of the groove 15, and eventually this material might pack and clog the upper end portion of the helical groove or the cylindrical shank 19 of the bit so as to seriously impair its operation. To prevent this, an oppositely helical groove 20, which need not consist of more than a single turn, is formed adjoining the groove 15 at the upper end so as to operate as a conveyor, tending to feed downwardly any chips which are carried to this height by the groove 15, and since the opening 17 extends opposite the lower end of the groove 20 where it connects with the groove 15, the chips feeding downward along the groove 20, and thus feeding upward along the groove 15, are easily discharged through the opening 17 as they tend to accumulate at the junction of the two helical passages. This feature is more particularly the subject matter of my aforesaid copending application, Serial No. 367,818.

As seen in Fig. 3, the shank of each bit 10 includes a reduced and threaded terminal portion 21 at its upper end, and this part is screwed into the threaded bore 22 of a drive spindle 23 journaled in the head 3 of the machine. Below the threaded portion 22 the end of the spindle is counter-bored at 24 and is formed with clutch teeth 25 for engagement with similar teeth 26 on the upper end of a clutch collar 27 mounted in alignment with the spindle shaft 23. The collar 27 is provided with a key or spline 27a which slidably engages in a groove or key slot 28 in the shank 19 of the auger bit 10 for driving it when the collar 27 is positioned with its clutch teeth in engagement with the toothed lower end of the drive spindle 23.

As seen in Fig. 2, a separate clutch collar 27 is provided for each of the auger bits 10. These clutch collars are normally held in driving relation to the spindles 23 by means of a slide 29 guided for limited vertical movement in the head 3 upon slide plates 30 which are secured to the front face of the head by screws 31, and extend into engagement with vertical grooves in opposite sides of the slide member 29. This member 29 is bored to accommodate the shanks 19 of the auger bits, and is counter-bored at 32 to engage the lower ends of the clutch collars 27. The slide rests upon a rock shaft 33 extending across the head 3, and said shaft is formed with a flat face 34 at one side, so that when the shaft is turned through an angle of 90 degrees by means of its handle 33a it acts as a cam to lower the slide 29 onto the flat face 34, thus lowering the clutch collars 27 out of driving connection with the toothed lower ends of the spindles 23.

With the slide 29 and the clutch collars 27 thus lowered it is possible to rotate each of the auger bits 10 for adjusting it endwise by means of its threaded connection at 21 with its spindle 23 so as to bring the tapered end portion 14 into correct relation to the flared portion 16 of the bore in the chisel 5 to insure that the auger will run freely in the chisel but without excessive clearance, and with its cutting spur 13 properly related to the lower end of the chisel body 5. It will be understood that the lower edges and corners of the body 5 are sharpened to cut away the portions of the mortise which are not removed by the augers themselves, and that resharpening of these edges will alter their relation to the lower ends of the augers so as to require readjustment of the latter by means of their threaded connections at 21 with the drive spindles 23. When each of the augers has been satisfactorily adjusted its clutch collar 27 is turned a few degrees one way or the other to bring its driving teeth 26 into registration between the teeth 25 of the spindle, and the cam shaft 33 is turned back to the position illustrated in Fig. 3 for elevating the slide 29 and thus lifting the clutch collars into driving engagement with the spindles.

It may be understood that each of the auger bits 10 has its cutting spur 13 so positioned as to cut a bore whose diameter is substantially equal to the thickness of the chisel member 5, as measured between its front and back outer faces. And as indicated in Fig. 2, the auger bits 10 are mounted in the chisel member 5 with their axes as close together as possible so that the lower end portions 14 of adjacent bits run very close together and their cutters 13 remove a large proportion of the material to be cut away in forming the mortise. In order that the augers 10 and their drive spindles 23 may be grouped so closely a gear train for driving the spindles 23 is arranged as shown in Fig. 4. From the housing 7 a drive shaft 35 extends into the head 3, and within a chamber 3a formed within the head 3 said shaft carries a gear 36 meshing with a pair of idler gears 37 journaled within said chamber. Each of the spindles 23 carries a gear 38 meshing with one of the idlers 37; but the faces of the gears 38 are slightly less than half the width of the faces of idlers 37, which permits one gear 38 to mesh with the upper portion of the idler 37 while the adjacent gear 38 meshes with the lower portion of the face of the same idler 37. Thus adjacent spindles 23 are driven in the same direction by the same idler 37, and each of the idlers 37 drives two of the four spindles with which the head 3 is equipped. In other words, both idlers 37 rotate in the same direction and both gears 38 driven by each idler 37 rotate in the same direction; hence, all four of the spindles 23 are driven in the same direction while the staggered arrangement of their drive gears 38 permits their axes to be located very close together and still allows the pinions 38 to be of a substantial size which is adequate to the load to be transmitted, and is also conveniently proportioned for economical production.

Near the upper end each spindle 23 is provided with a flange 40 running between bearings 41 of suitable bearing metal for supporting the spindle vertically in position, and the working thrust against the spindle is arranged to be taken by the ball 42 disposed between the upper end of the spindle and the plug 43, having a beveled upper face 44 which is engaged by the conical end 45 of an adjusting screw 46 by which the position of the thrust bearing may be accurately regulated.

I claim as my invention:

1. In a mortising machine, a chisel member with an auger bit mounted for rotation within a bore in the chisel, the chisel having cutting edges adjacent the lower end of said bore and the auger

having a cutter at its lower end to cooperate with said cutting edges of the chisel, a drive spindle aligned with the auger bit, and means connecting the bit to the spindle adjustable to shift the bit endwise in the chisel bore for correctly positioning its cutter in relation to the cutting edges of the chisel, together with interengageable clutch members on the bit and spindle respectively, one of said clutch members being axially slidable for disengagement from the other independently of the part with which it is rotatably connected and through a distance greater than that required for disengagement of the clutch.

2. In a mortising machine, a chisel member with an auger bit mounted for rotation within a bore in the chisel, the chisel having cutting edges adjacent the lower end of said bore and the auger having a cutter at its lower end to cooperate with said cutting edges of the chisel, a drive spindle aligned with the auger bit, the lower end of the spindle and the upper end of the bit being threaded for interengagement to permit endwise adjustment of the bit for correctly positioning its cutter in relation to the cutting edges of the chisel, together with a clutch member on the spindle and a cooperating clutch collar slidable axially on the bit into and out of engagement with the spindle clutch member but splined to the bit to form a drive connection from the spindle thereto.

3. In a mortising machine, a chisel member with a plurality of auger bits mounted for rotation within parallel bores in the chisel, said chisel having cutting edges adjacent the lower ends of said bores and the augers having cutters at their lower ends to cooperate with said cutting edges of the chisel, a plurality of drive spindles aligned with the auger bits respectively, means connecting each bit to one of the spindles and adjustable to shift the bit endwise in the chisel bore for correctly positioning its cutter in relation to the cutting edges of the chisel, and disengageable clutch means providing a driving connection between each spindle and its bit, together with means operable to shift all the clutches simultaneously.

4. In a mortising machine, a chisel member with a plurality of auger bits mounted for rotation within parallel bores in the chisel, said chisel having cutting edges adjacent the lower ends of said bores and the augers having cutters at their lower ends to cooperate with said cutting edges of the chisel, a plurality of drive spindles aligned with the auger bits respectively, each spindle and its bit having a threaded engagement permitting endwise adjustment of the spindle for correctly positioning its cutter in relation to the cutting edges of the chisel, and a pair of interengageable clutch members on each bit and spindle respectively, one member of each pair being axially slidable for disengagement from the other without separation of the threaded connection between the bit and spindle, and means operable to shift all said slidable clutch members simultaneously.

5. In a drilling machine, a drilling tool, a drive spindle aligned therewith, the lower end of the spindle and the upper end of the tool being threaded for interengagement to permit endwise adjustment of the tool, a clutch member on the spindle, and a cooperating clutch collar slidable axially on the tool into and out of engagement with the spindle clutch member but splined to the tool to form a drive connection from the spindle thereto.

6. In a multiple spindle machine, a plurality of drilling tools positioned for rotation upon parallel axes, a plurality of drive spindles aligned with the tools respectively, means connecting each tool to one of the spindles and adjustable to shift the tool endwise with respect to the spindle, and disengageable clutch means providing a driving connection between each spindle and its tool together with means operable to shift all the clutches simultaneously.

7. In a multiple spindle machine, a plurality of tools positioned for rotation upon parallel axes, a plurality of drive spindles aligned with the tools respectively, a clutch member on each spindle, and a cooperating clutch collar slidable axially on each tool into and out of engagement with the spindle clutch member but splined to the tool to form a driving connection on the spindle thereto, together with a transversely extending slide member engaging a transverse shoulder of each of said clutch collars and guided for movement parallel to their axes of rotation, and means for moving said slide member to engage or disengage the clutch collars simultaneously.

8. In a drilling machine, in combination, a drilling tool comprising a first part, a drive spindle aligned therewith and comprising a second part, means connecting the tool to the spindle, said means being adjustable to shift the tool endwise with respect to the spindle for varying the distance of its cutting end from the end of the spindle, inter-engageable clutch members on the tool and spindle respectively, one of said members being located on one of said parts so that it rotates therewith, and means forming a splined connection between the other of said clutch members and the other of said parts so that it rotates therewith and is slidable longitudinally thereof into and out of engagement with the first clutch member.

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