June 3, 1930. B. P. GRAVES ET AL 1,761,121

TRIPPING MECHANISM

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Fig. 6.

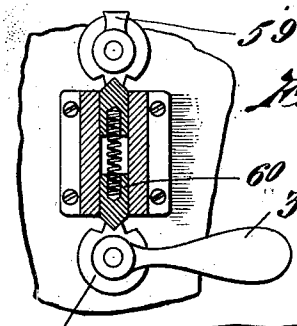


Fig. 1.

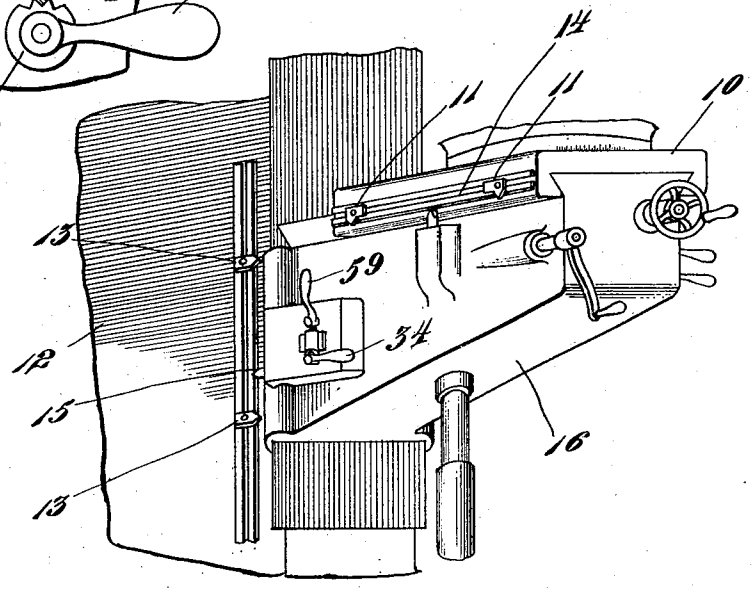


Fig. 5.

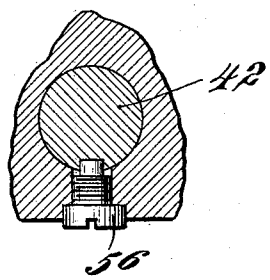
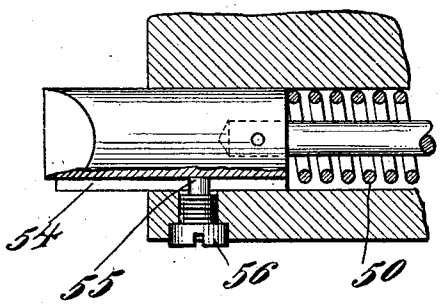


Fig. 4.



Inventors.
Benjamin P. Graves.
Walter F. Smith.
BY Barlow & Barlow
ATTORNEYS.

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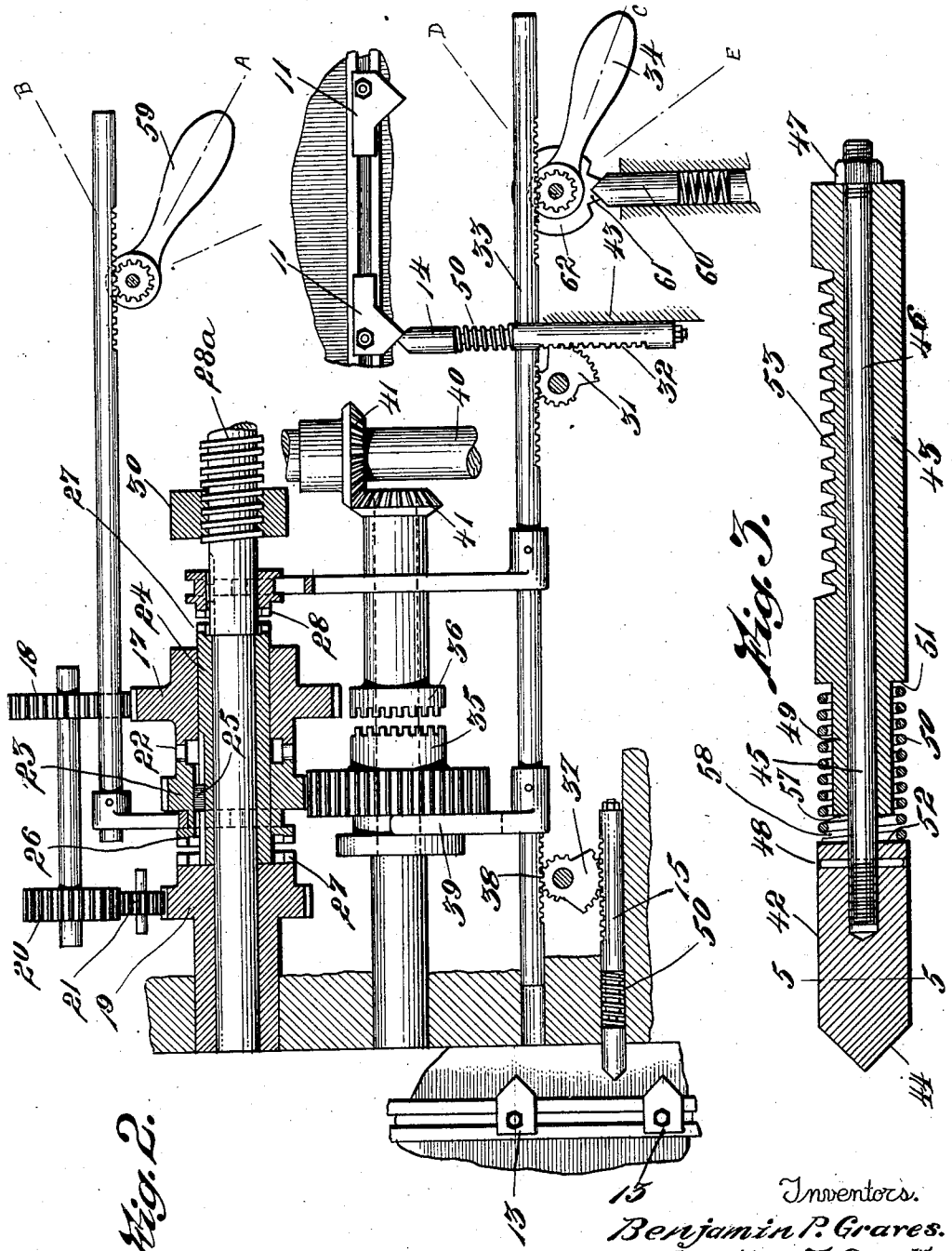


Fig. 2.

Fig. 3.

Inventors.
Benjamin P. Graves.
Walter F. Smith.
BY Barlow & Barlow
ATTORNEYS.

Patented June 3, 1930 1,761,121

UNITED STATES PATENT OFFICE

BENJAMIN P. GRAVES, OF EDGEWOOD, AND WALTER F. SMITH, OF PROVIDENCE, RHODE ISLAND, ASSIGNORS TO BROWN & SHARPE MANUFACTURING COMPANY, OF PROVIDENCE, RHODE ISLAND, A CORPORATION OF RHODE ISLAND

TRIPPING MECHANISM

Application filed August 20, 1928. Serial No. 300,912.

This invention relates to trip mechanism for power driven machine tools and the like, and has for its object to provide a construction of mechanism for such machines whereby the power feed may be automatically disengaged to arrest the travel of the parts and then manually reengaged to resume the driving operation without disturbing the position of the trip plunger relative to the dog that automatically tripped it.

A further object of the invention is to accomplish this tripping action by the use of a two-part plunger in which the whole plunger is moved by engagement with the dog to arrest the operation of the feed mechanism and one part of the plunger is permitted to be moved independently of the other part thereof to restore the feed connection without moving the dog-engaging part of the plunger from its stop position.

The invention further consists in the provision of a trip plunger carried by one of the relatively traveling members of the machine and the forming of this plunger in two parts having a flexible member between the parts through which a working movement is transmitted, one of the plunger parts being positioned to engage the trip dog of the machine to move the other part through the flexible member to stop the travel and means being also provided whereby the other of said parts may be moved against the tension of this flexible member to again start the traveling member without disturbing the first mentioned part of the plunger in engagement with the trip dog.

With these and other objects in view, the invention consists of certain novel features of construction, as will be more fully described, and particularly pointed out in the appended claims.

In the accompanying drawings:

Figure 1 is a perspective view illustrating the improved trip device as applied to a milling machine for controlling the vertical feed of the knee and the forward and back feed of the saddle.

Figure 2 is a diagrammatic view illustrating two sets of dogs, one of which may be mounted on a traveling member to cooperate with the relatively fixed tripping plunger while the other set is mounted on a relatively fixed member to cooperate with the trip plunger which is mounted on the relatively movable member.

Figure 3 is an enlarged elevation partly in section illustrating my improved two-part plunger and the means for operatively connecting the parts of the plunger together.

Figure 4 is a fragmental view showing the keyway in the plunger as engaged by the end of a screw to prevent axial rotation of this plunger.

Figure 5 is a sectional end view of the plunger on line 5—5 of Figure 3.

Figure 6 is a view partly in section showing the spring pressed latch members as engaging the lever plates of the directional lever and in the feed engaging lever to assist in completing the throw of each to the desired position.

It is found in the practical operation of power driven machine tools of this general character where adjustable tripping dogs are employed on one member of the machine to be engaged by a cooperating trip plunger on a relatively movable part of the machine, that where this plunger is formed rigid and is moved bodily by the dog to operate the stop mechanism, it is necessary to manually move either that part of the machine which carries the plunger or to move one of the dogs out of alignment with the plunger in order to be able to reset the operating mechanism to continue or reverse its travel. To obviate this difficulty and be permitted to again start the traveling member without this manual adjustment of the members, we have provided a plunger which is formed in two parts, a head to engage the trip dog and a body part operatively connected to the drive clutch, and we have provided a coil spring between these two parts of the plunger so arranged that a movement of the dog-engaging or head part is transmitted to the other or body part to withdraw the clutch and stop the machine, and by means of this spring connection between the parts the body part may be moved against its tension to permit the clutch to be moved again into

engagement to restore the driving mechanism without disturbing the head part of the plunger from engagement with its dog; and the following is a detailed description of the present embodiment of the invention and showing one arrangement of mechanism by which these advantageous results may be accomplished:

With reference to the drawings 10 designates the traveling saddle member of a milling machine which is provided with a pair of spaced trip dogs 11 adapted to be adjusted toward and from each other in the usual way and 12 is a relatively fixed portion of the frame of the machine on which is shown another pair of spaced trip dogs 13 arranged to be vertically adjusted toward and from each other as is usual in such machines.

In the path of movement of the traveling dogs 11, we have operatively mounted a trip plunger 14 to be actuated to stop the travel of the saddle upon engagement with the dog when fed to the required designated point, and a second trip plunger 15 is shown as being carried by the vertically movable knee member 16 of the machine to work between the dogs 13 to arrest the travel of this knee upon engagement with a dog 13.

One general arrangement of mechanism is herein shown in Figure 2 for connecting up these two trip plungers whereby each may act independently of the other to operate mechanism to arrest the travel of the member controlled by it.

In this mechanism is shown the gear 17 which is driven in one direction through gear 18, and gear 19 driven in the opposite direction through the gear 20 and idler 21.

The gear 17 is provided with clutch teeth 22 engaged by adjacent teeth of the master clutch 23. This master clutch is mounted on the sleeve 24 to which it is slidably connected by a key 25 and this clutch also has teeth 26 on its opposite end to engage corresponding teeth 27 on the reverse gear 19. By this construction it will be seen that the sleeve 24 may be rotated in either direction and on one end thereof is formed clutch teeth 27^a arranged to engage those of the clutch 28, whereby when this clutch 28 is in envagement with the sleeve 24 the lead screw 29 is rotated to drive the nut 30 and through it cause the saddle 10 to move either inward or outward as desired and by withdrawing the clutch 28 from engagement, the saddle feed is stopped. When it is desired to start the knee member on its feeding movement, the feed engaging lever 34 is moved downward, thereby causing the shift rod 33 to throw the clutch 35 into engagement with the clutch 36 which movement of this rod also moves the plunger 15 through segment 37 up into position to engage one of the dogs 13. The knee now begins to travel in a vertical direction and when its plunger 15 engages its dog 13 the plunger is forced inwardly which in turn operates the segment 37 and through the teeth 38 to move the shift rod to the left and through yoke 39 remove the clutch teeth 35 from clutch teeth 36 to stop the rotation of shaft 40 through gears 41 to arrest the vertical feed of the knee.

In practice the plunger in performing the feed stopping operation, rides up onto the point of its dog and thus imparts motion to its plunger sufficient to perform the stopping operation, and when this plunger was made solid it was necessary to either remove the engaged dog or to manually rotate or operate members of the machine sufficiently to move the plunger to clear the dog or vice versa which was found to be inconvenient as considerable time was wasted in again resetting the machine to continue its feeding operation. Therefore, to obviate this difficulty the plunger has been constructed in two parts as best illustrated in Figure 3, the head part 42, and the body part 43, the head part being beveled on its end as at 44 to ride up on the beveled portion of the dog and in this head part has been screwed the threaded end of the spindle 45 to extend down through the central bore 46 in the body, its lower end being provided with a nut 47 to limit the space between the parts and this spindle is further secured in the head by means of the lock pin 48. The upper end of the body portion is provided with a reduced neck portion 49 which extends into a compression coil spring 50. One end of the coil engages the body shoulder 51, while the other end rests on the under face 52 of the head. This body portion is also provided with a set of ratchet teeth 53 which are engaged by the segment 37 through which motion is transmitted to the operating parts.

The head member is slotted longitudinally as at 54 into which the end 55 of the screw 56 extends to hold its bevel in position to properly engage the dog upon coming in contact therewith, the body part being retained in proper axial alignment by engagement with its geared segment. By the use of this improved construction, when this plunger head rides up onto its dog, the spring is designed to be of sufficient stiffness to impart a corresponding motion to the body portion of the plunger and through this movement of the body portion operates the segment and the shift rod to arrest the motion of the traveling member. For instance, in the case of plunger 14 when riding up on its dog 11 the clutch 28 is withdrawn from the teeth 27, thereby arresting rotation of screw 28^a and travel of the saddle 10.

If it is desired to reverse the direction of travel of saddle 10 through screw 28^a, it is only necessary to swing the directional lever 59 upward to position B which moves the master clutch from engagement with the gear

17 into engagement with reverse gear 19 to reverse the rotation of sleeve 24, then the feed engaging lever 34 may be moved from position C to position D which rotates the segment 31 to lift the body portion 43 of the plunger against tension of its spring 50 and at the same time connects the clutch 28 with clutch teeth 27 of the sleeve 24 thus again starting the saddle member into action without the necessity of moving either the plunger or the dog 11 out of alignment with each other.

The same general operation is effected through the plunger 15 when in engagement with one of its dogs 13, whereby when this plunger is moved inwardly to remove clutch 35 from clutch 36 assuming that directional lever 59 is in position illustrated, it may be moved from the position A to position B to reverse the direction of rotation of clutch 35. Then feed engaging lever 34 may be moved from position *c* to position *e* to reengage the clutch 35 with clutch 36 and the feeding movement is resumed, without first being obliged to remove the plunger 15 from alignment with its engaged dog 13.

The end 52 of the head and the end 57 of the body of the plunger are accurately spaced to permit a sufficient movement of the body towards the head, when the head is partly thrown by the dog, to move the tripped mechanism back into operating engagement without disturbing the head member of the plunger. Also, this space is so calculated that if the spring 50 should for any reason break, the movement of the head as the result of a complete throwing by the dog will cause its end 52 to engage the end 57 of the body portion and move the body portion just sufficiently to cause the teeth of one member of the feed clutch to be just disengaged from the other member thereof, and in order to be sure that this disengagement is effected, we have positioned the V-shaped end of the spring pressed latch 60 to engage the inclined wall 61 of the lever plate 62 geared to the rack rod 33 and so be sure to disengage the clutch members. Similar notches are also provided in this lever plate to cooperate with the movement of plunger 15 to assist in completing its clutch moving operation in case the spring in this plunger should for any cause be broken.

By the use of this improved construction of plunger the work to again start the traveling member into action is greatly facilitated and much time is saved in the operation.

The foregoing description is directed solely towards the construction illustrated, but we desire it to be understood that we reserve the privilege of resorting to all the mechanical changes to which the device is susceptible, the invention being defined and limited only by the terms of the appended claims.

We claim:—

1. A trip mechanism for machines having relatively traveling members, a trip dog carried by one of said members, a cooperating trip element carried by the other of said members engageable by travel of said dog, said element being formed in two parts, means whereby both parts are adapted to be moved upon engagement of one part with said dog to stop the traveling member and means for moving the other part independently of the engaged part to permit said member to resume its travel.

2. A trip mechanism for machines having relatively traveling members, a stop dog carried by one of said members, a cooperating stop element carried by another of said members, said stop element being formed in two connected parts, the first part arranged to engage the dog, means connecting the second part with the travel control mechanism, said second part being adapted to be moved relative to the first part, means whereby engagement of said first part with said dog renders the travel control mechanism inoperative, and means for moving said second part, independently of the first part, whereby said control mechanism may be restored to operative position without moving said first part from its dog engaging position.

3. In a machine tool having relatively traveling members, a trip dog on one of said members, a cooperating trip plunger carried by the other of said members, said plunger being formed in two parts, one part being positioned to engage said dog and the other being operatively connected to the travel control of the movable member, a spring connecting said parts, both parts being adapted to be moved upon engagement of the first part with said dog to shift the travel control to inoperative position and stop the traveling member and means for moving the other part against compression of the spring to shift the travel control to operative position and permit the traveling member to resume its motion.

4. In a machine tool having relatively traveling members, driving mechanism for the traveling member carried by one of said members, a cooperating trip plunger carried by the other of said members, said plunger comprising in two cooperating connected parts, one part being arranged to engage said dog and the other part being operatively connected to said mechanism, means responsive to a movement of the first part when engaged by said dog to move the second part to render the driving mechanism inoperative, and means whereby said second part may be moved independently of said first part to render said driving mechanism operative.

5. A trip mechanism for a machine having relatively traveling members with a trip dog

on one of said members, comprising a cooperating trip plunger carried on another of said members, said plunger being formed in two parts, one part having a connecting guide spindle slidable in the other part, a compression spring acting between said parts, one of said parts being positioned to engage said dog to move the other part through said spring and stop said traveling member, and means whereby said other part may be independently moved against the tension of said spring to again start the traveling member without disturbing the first mentioned part of said plunger from engagement with its dog.

6. A trip mechanism for machines having relatively traveling members and travel control mechanism, a stop dog carried by one of said members, a cooperating stop element carried by another of said members, said stop element being formed in two connected parts, a first part being arranged to engage the dog, means operatively connecting the second part with the travel control mechanism whereby movement of said first part renders said control mechanism inoperative, said second part being movable relative to said first part, and means whereby movement of said second part restores said control mechanism to operative position and causes said members to resume their relative travel without moving said first part from its dog engaging position.

7. In a trip mechanism for a machine having relatively traveling members, a trip dog on one of said members, a co-operating trip plunger carried by the other of said members, said plunger being formed in two parts and having a yieldable member intermediate said parts through which motion is transmitted from one part to the other, and means for limiting the relative movement of both of said plunger parts.

8. In a trip mechanism for a machine having relatively movable members, cooperating tripping elements on said members arranged to arrest the traveling member at a predetermined point in its travel, one of said tripping elements comprising a plunger, said plunger being formed in two parts, a spring interposed between said parts and cooperating stops in said parts for limiting the relative axial movement of the plunger parts in one direction.

9. In a trip mechanism for a machine having relatively traveling members, a trip dog on one of said members, a cooperating trip plunger carried by the other of said members, said plunger being formed in two parts, one part having a guide device slidable in the other part, a yieldable member intermediate said parts through which motion is transmitted from one part to the other, and cooperating stop shoulders in said plunger parts for limiting the relative axial movement of said plunger parts.

10. In a machine tool having two relatively movable members and a driving mechanism, a trip dog on one member, a movable dog engaging element on the other member, a shift element for said mechanism, means operatively connecting the dog engaging element and the shift element for moving said shift element when said dog engaging element is moved by said trip dog, and means for independently moving said shift element.

11. In a machine tool having two relatively movable members, a driving mechanism, a clutch therefor, tripping means on one member, a shift control element on the second member movable when engaged by said tripping means, means for uncoupling said clutch on movement of said shift control element, and means for coupling said clutch while said shift control element is in uncoupling postion, said uncoupling means being constructed to lock said clutch in uncoupled position on further movement of said shift control element by said tripping means.

In testimony whereof we affix our signatures

BENJAMIN P. GRAVES.
WALTER F. SMITH.