

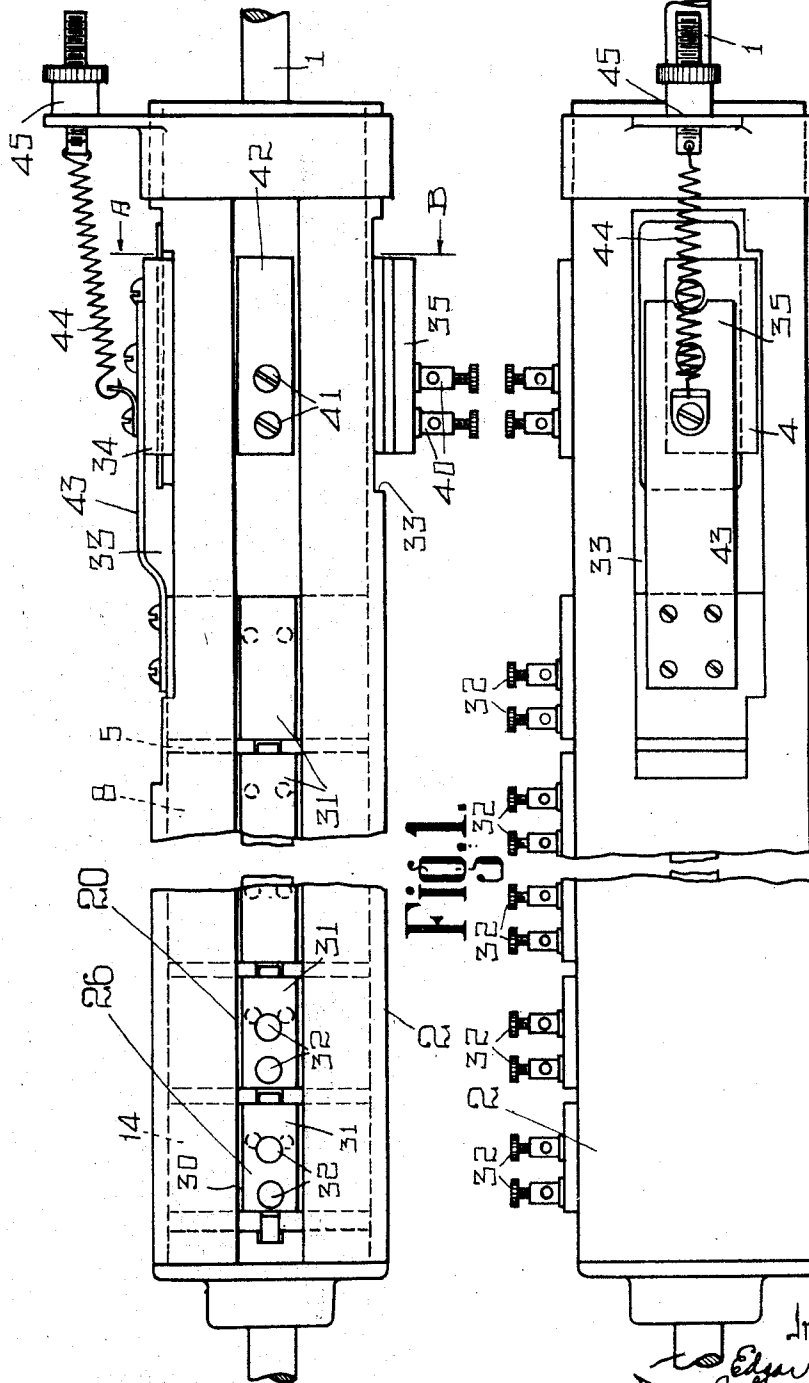
June 2, 1925.

1,540,741

E. K. HUNTER ET AL
MECHANISM FOR SETTING OR DISPLACING A TOOL
OR OTHER DEVICE BY A PREDETERMINED AMOUNT

Filed Oct. 20, 1924

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

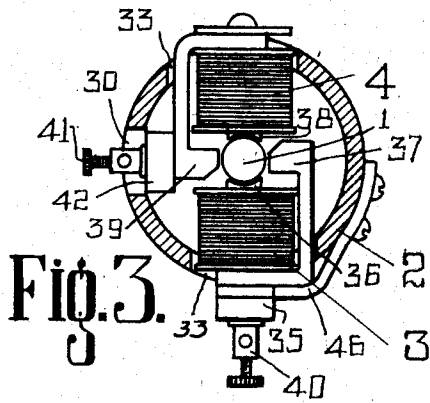


Fig. 3.

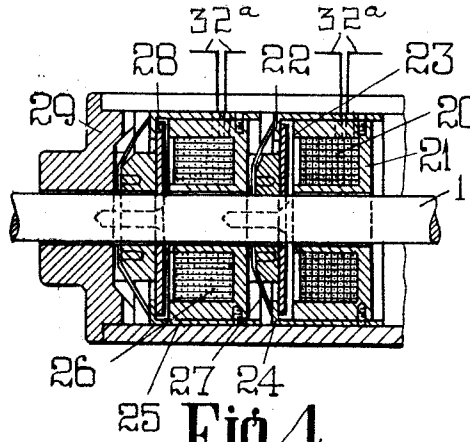


Fig. 4.

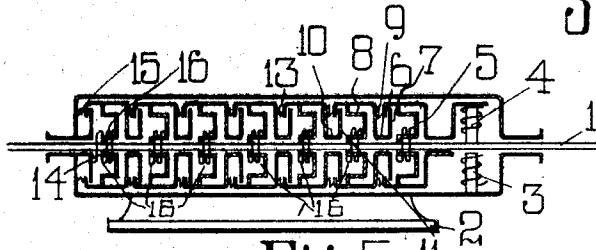


Fig. 5.

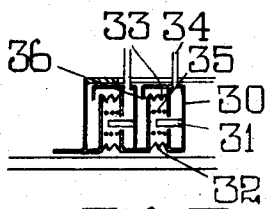


Fig. 7.

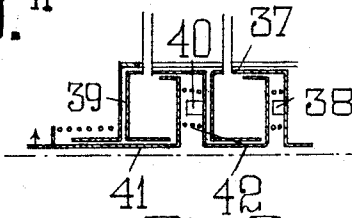


Fig. 8.

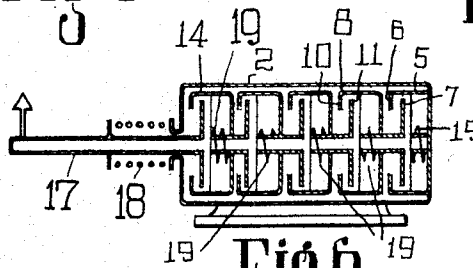


Fig. 6.

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UNITED STATES PATENT OFFICE.

EDGAR KENNETH HUNTER AND JOHANNES ROBERT CARL AUGUST, OF LONDON,
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MECHANISM FOR SETTING OR DISPLACING A TOOL OR OTHER DEVICE BY A PREDE-
TERMINED AMOUNT.

Application filed October 20, 1924. Serial No. 744,711.

To all whom it may concern:

Be it known that we, EDGAR KENNETH HUNTER and JOHANNES ROBERT CARL AUGUST, subjects of the King of Great Britain, residing in London, in the county of Middlesex and Kingdom of England, have invented certain new and useful Improvements in Mechanism for Setting or Displacing a Tool or Other Device by a Predetermined Amount, of which the following is a specification.

The present invention relates to an improved setting mechanism for the displacement of an element by accurately predetermined variable amounts.

According to the present invention between a pair of fixed stops one or more elements are arranged capable of free motion between said stops, means being provided to normally hold said element or elements at a fixed distance from said stop or from one another and a further means to displace said element through this distance by a force acting in a set line, such as electromagnetic attraction or by fluid pressure.

In the simplest form of construction of the setting device of the present invention, between a pair of fixed stops a soft iron element is placed and maintained by a light spring at a predetermined definite distance from one stop and in contact with the other, electromagnetic means being provided so that when desired the force of this spring can be overcome to bring this element out of contact with one stop into contact with the other. This element may be either permanently coupled to a second element which it is desired to accurately displace or can be temporarily coupled to it by mechanical clamping means or preferably by an electromagnetic clutch.

Instead of the operating means being electromagnetic as above stated, the element may be formed in two parts, telescopic upon one another, either forced apart or contracted as the case may be by fluid pressure, such as steam or air.

In a more developed form of the arrangement of the present invention, between two stops there will be arranged a series of loose elements normally held spaced, for instance, by light springs at varying distances apart, these distances preferably being in the ratio of the geometrical progression 1, 2, 4, 8, 16,

32 . . . means then being provided whereby any one or more of these elements can be moved up to its neighbor against the light spring, and this motion if desired, transmitted by coupling the final element of the series to a bar or other element to be displaced through the sum of the said set distances.

The invention is more particularly described with reference to the accompanying drawings, in which:

Figure 1 is a plan view of an electrical setting mechanism according to the present invention.

Figure 2 is a corresponding side elevation.

Figure 3 is a section on the line A—B of Fig. 1.

Figure 4 is a partial longitudinal section corresponding to Fig. 2.

Figure 5 is a diagrammatic view corresponding to Fig. 2.

Figure 6 is a modified form of construction.

Figure 7 shows diagrammatically a method of operation by suction.

Figure 8 shows diagrammatically a method of operation by fluid pressure.

In Figures 1, 2, 3 and 4, the casing 2 is hollow and surrounds the shaft 1 loosely and has an annular chamber between its inner wall and the shaft for receiving the setting elements as described hereinafter. A longitudinal slot 30 on the top of the casing serves as a guide for the insulating blocks 31 for each element. These blocks 31 carry the terminals 32, for the conductors 32^a which permit the individual energization of the electromagnets 20 of the respective elements.

As shown in Figure 4 the electro-magnets are preferably in the form of annular coils 20 arranged in a housing 21 embracing and sliding loosely along a shaft 1 in a straight line. It will be understood that magnets of this type can equally well slide in the arc of a circle about a central point or in any other guided path.

Each housing 21 has a stop 22 upon it and a stop surface 23. An armature 24 is provided which is mounted on the housing 25 of the next electro-magnet 26 of the series and is held up by a spring 27 against the stop 22 of the electro-magnet 20.

The final armature 28 of the whole series will be mounted on the rigid end 29 of the casing.

The casing 2 also has two further slots 33 which serve as guides for the blocks 34, 35 of the locking electro-magnets 4, 5. These magnets have the respective polepieces 36, 37 and 38, 39, and the terminals 40, 40 and 41, 41 mounted on insulating blocks 35 and 42. The block 34 is connected to the first element 5 by a strap 43; and to reinforce the spring 27 and compensate the greater inertia of the element 5 and the magnets 4, a coil spring 44 is provided, having an adjustable support on the casing 2 at 45. The magnet 3 is held rigid with the casing 2 by a strap 46.

As shown diagrammatically in Fig. 5, a shaft 1 which is the element to be displaced through accurately set predetermined amounts may be locked to a rigid frame 2 by an electro-magnet 3 or may be locked by an electro-magnet 4 to one of the loose elements 5 of the setting mechanism which is the last in the series. This element has a stop 6 abutting against a stop 7 of the next element 8 of the series and held away in the opposite direction by means of a light spring 9. In the same way the element 8 has a stop 10 upon it co-operating with a stop 11 of the next element of the series being held by a light spring 13 away from it by a definite set distance which will show up a different set distance to that between the elements 5 and 8. The final element 14 of the series is held away by a light spring 15 at a set distance from the fixed casing 2. Each element has an electro-magnet or magnets 16 which can be individually energized to bring any individual element in intimate contact with the next element of the series collapsing the light spring between them so that if, for example, the electro-magnet 4 is energized to be locked to the shaft 1 and then any of the electro-magnets 16 are energized the shaft 1 will be displaced through the set distance between the element carrying the particular electro-magnet 16 which has been energized and the next element of the series in the direction towards the spring 15 or if two or more of these elements are energized then the shaft 1 will be displaced by the sum of the distances between these elements and the next elements of the series, in the direction towards the spring 15.

It is preferred that an automatic control be provided for the electro-magnets 3 and 4 so that the electro-magnet 3 will normally be always energized to hold the shaft 1 locked and will only be de-energized slightly subsequent to the energizing of the electro-magnet 4 so there can be no slip in the accurate displacement of the shaft 1.

Means may of course, be provided to de-energize both electro-magnets 3 and 4 when

it is desired to return the shaft 1 backwards, for instance, by means of a spring, which returns the shaft to the zero position when the electro-magnets are de-energized.

In the arrangement diagrammatically shown by way of example in Figure 6 a shaft 17 is directly displaced against the spring 18 whenever any of the electro-magnets 19 are energized. The common spring 18 in this case takes the place of all the small springs 15 (Figure 5).

It is obvious that the elements instead of being displaced by electro-magnetic attraction can be displaced by fluid pressure. In the case as shown in Figure 7 each element may be in the form of a chamber 30 carrying a stop 31 upon it connecting with the wall 32 of the next chamber connected with the chamber 30 by flexible bellows 33, air being sucked out through flexible connections 34. The bellows 33 are normally maintained expanded by the springs 35, whilst the stop 36 on the element 30 sets a limit to the expansion of the bellows.

A somewhat similar construction is shown in Figure 8 operating by fluid pressure. Here the chamber consists of telescopic elements 37, 38, the elements 38 forming part of the chamber 39 with the next element of the series and having a stop 40 upon it abutting with either displaceable shaft or part 1, or with the next element of the series, as the case may be. These telescopic elements are expanded by fluid pressure against springs 42.

The final element of the series of elements as shown in Fig. 2 can be provided with an electro-magnetic clutch 46 by which it can be locked to the shaft 1, or other element to be displaced. A suction grip could be substituted for the clutch 46.

It is preferred that the ratio of distance between each of the elements of a series should be in the geometric ratio of 1, 2, 4, 8, 16, 32 . . . In this way, any desired displacement may be attained with the fewest possible number of elements: Thus, 1, 2, 2+1, 4, 4+1, 4+2, 4+2+1, 8, 8+1, 8+2, 8+2+1, 8+4, 8+4+1, 8+4+2, 8+4+2+1, will afford increments of a single integer each from 1 to 15, and it is apparent that this series may be extended to any number of terms equal to $(2n-1)$ where n is the displacement of the last element.

The setting mechanism of the present invention can be operated automatically at a very high rate of speed, from for instance a punched paper or other strip, the punchings of which will co-operate with brushed allowing the closing of the individual electro-magnetic circuits one after the other which will co-operate with a tracker board controlling inlet or outlet of pressure fluid, as the case may be.

The fluid pressure may be steam or air,

suction or pressure, or again may be hydraulic, such as water or oil acting against the light springs.

We declare that what we claim is:—

5 1. A setting mechanism comprising in combination a number of loose elements, guides for said elements, a stop, light springs maintaining said elements displaced from one another and from said stop at pre-
10 determined varying distances, means to connect the elements most remote from the stop to a body to be displaced, and means to bring together a number of said elements against the light springs supporting them,
15 whereby the said body is displaced by the distance apart of said elements so brought together.

2. A setting mechanism comprising in combination a number of loose elements, guides for said elements, a stop, light springs maintaining said elements displaced from one another and from said stop at prede-
20 termined varying distances, means to connect the elements most remote from the stop to a body to be displaced, and electro-magnetic means to attract any two of said elements together, whereby the body is displaced by the amount of displacement between the
25 elements so attracted.

3. A setting mechanism comprising in combination a number of loose electro-magnets, guides for said electro-magnets, a stop, light springs between said electro-magnets displacing them from one another, and from
35 said stop, so that they normally lie at predetermined varying distances, and means to energize any one of said electro-magnets to cause its neighbor to be attracted to it and secondly, displace the electro-magnet most
40 remote from the said stop and attached to it by an amount equal to the space normally between the electro-magnet which has been energized and the next electro-magnet to it.

4. A setting mechanism comprising in combination a number of loose elements, guides for said elements, light springs main-
45 taining the elements displaced from one another and from said stop, at distances which are in the ratio of the terms of the fundamental geometrical progression of the basis 1 and constant ratio 2 and means
50 to bring together any two of said elements to cause the displacement of the elements most remote from the stop and connected to it by the amount of said displacement.

5. A setting mechanism comprising in

combination a number of loose elements, guides for said elements, a stop, light springs maintaining said elements displaced from one another and from said stop at predeter-
60 mined varying distances, means to connect the elements most remote from the stop to a body to be displaced, and means to bring together any two of said elements against the light springs supporting them, whereby
65 the said body is displaced by the distance apart of said elements so brought together.

6. A setting mechanism comprising in combination a rod, a number of discs loosely
70 slidable on said rod, a stop on said rod, light springs maintaining said discs displaced from one another and from said stop, a finger on each disc setting a limit to the displacement of the neighbouring disc from
75 it, and means to draw in two of said discs together against the springs supporting them.

7. A setting mechanism comprising in combination a rod, a number of discs loosely
80 slidable on said rod, a stop on said rod, light springs maintaining said discs displaced from one another and from said stop, a finger on each disc setting a limit to the displacement of the neighbouring disc from
85 it, and means to draw in two of said discs together against the springs supporting them, and means to clutch the disc most remote from said stop to a body to be displaced by a variable amount.

8. A setting mechanism comprising in combination a rod, a number of discs, loosely
90 slidable on said rod, each comprising an electro-magnet and armature, light springs maintaining the said discs displaced from one another and from said stop, a finger
95 on each disc engaging the neighbouring disc to set a limit to their relative normal displacement by reason of the springs between them, and means to energize any one of said electro-magnets to draw up the discs
100 to one another against the action of said springs.

In witness whereof we have hereunto signed our names this 3rd day of October, 1924, in the presence of two subscribing
105 witnesses.

EDGAR KENNETH HUNTER.
J. ROBERT CARL AUGUST.

Witnesses:

HATTIE ARMSTRONG,
E. ARNOLD SYME.