PATENT SPECIFICATION

707,804

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COMPLETE SPECIFICATION

Improvements in or relating to a Reversing Mechanism connecting the Revolution-Counting Device and Repeating Drums of a Calculating Machine

We, ATELIERS VAUCANSON, a Company organised according to the laws of France, of 11 rue du Surmelin, Paris, France, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

Calculating machines comprising "Odhner" repeating drums, are normally provided with a device associated with the repeating drums for counting the number of revolutions of these drums. Such machines are intended to perform both multiplying and dividing operations. In the case of multiplication, the revolution counter must record the number of times the multiplicand is added to itself and in the case of division, it must record the number of times the divisor is subtracted from the dividend.

It is therefore necessary to provide a mechanism by means of which the counter can positively record the number of revolutions of the repeating drums, which turn in one direction for multiplication and in the opposite direction for division. This mechanism is a direction changer, by means of which the control shaft of the counter is caused to turn either in the same direction as the shaft of the repeating drums or in the opposite direction.

The present invention has for its object to provide a reliably operating direction-changing mechanism of simple construction.

According to the present invention a reversing mechanism connecting the resolution counting device and repeating drums of a calculating machine comprises two pinions fast with an auxiliary shaft parallel to the shaft of the counting device and adapted to move longitudinally, one of the pinions constantly meshing with a pinion fast with the shaft of the counting device and the other pinion being adapted to mesh either with a pinion keyed on the shaft of the repeating drums or with an auxiliary pinion in engagement with the latter pinion.

The longitudinal displacement of the auxiliary shaft may be effected by a forked lever with which there is associated a resilient locking device which maintains the shaft in one operating position or the other.

In addition, in order to prevent the auxiliary shaft from being shifted before the shaft of the repeating drums has completed a revolution, there may be provided in association with one of the pinions of the auxiliary shaft a stop which is situated in the path along which the pinion must travel in order to reach the positions corresponding to the two directions of operation. This pinion is formed with a notch which is so positioned as to move into a position opposite the stop, in order to permit longitudinal displacement of the pinion, only when the control shaft of the repeating drums occupies the inoperative position corresponding to the commencement or the end of a revolution.

The reversing pinions may be displaced by means of a rocking lever controlled by the machine in accordance with the operations to be effected.

The rocking lever may be displaced by a rod resiliently urged into one position corresponding to one of its directions of operation and a locking device may be provided to maintain the rod in a second position. This locking device may consist of a second rod, also resiliently urged, which forms an abutment for the first rod when the latter occupies the second position.

Two examples of the invention will now be described in greater detail with reference to the accompanying drawings of which:—

Figure 1 is an elevation, partly in section, of a reversing mechanism, shown in the position corresponding to the direct

driving of the counting device by the control shaft of the repeating drums.

Figure 2 is a view similar to that of Figure 1, showing the reversing mechanism in the other position;

Figure 3 is a section on the line III—III of Figure 2;

Figure 4 is a perspective view of the reversing pinions;

Figure 5 is a diagrammatic view, in side elevation, of a modified constructional form of the reversing mechanism, in the position corresponding to the direct driving of the shaft of the repeating drums by the driving shaft;

Figure 6 is a sectional view similar to that of Figure 5, showing the reversing mechanism in the other position;

Figure 7 is a section on the line VII—VII of Figure 6;

Figure 8 is a diagrammatic view in perspective showing the mechanism for controlling the reversing lever in the position for direct driving, and

Figure 9 is a view similar to that of Figure 8 showing the said mechanism in the other position.

In the constructional form illustrated in Figures 1 to 4, the mechanism is supported by the plates 1 and 2 of the frame of the calculating machine and only the parts essential to the description of the invention have been shown, the counting mechanism itself being of any known type.

The carry-over discs 3 of the counting mechanism are mounted on a shaft 4 which is in turn mounted at one end in a bearing 5 supported by the cheek 1 and at the other end on a trunnion 6 of the shaft 7 of the repeating drums. The shaft 7 is in turn mounted in a bearing 8 supported by a plate 2. Thus the shaft 4 forms an extension of the shaft 7 and can turn independently thereof. Keyed on the left-hand end (as seen in Fig. 1) of the shaft 4 is a wide pinion 9. The left-hand end of the shaft 7 supports a pinion 10, which can be mounted on the said shaft by means of a device for the adjustment of the angular position thereof. This device has been omitted from the drawing for the sake of clarity.

The pinion 10, which is narrower than the pinion 9, meshes permanently with a reversing pinion 11 mounted on a stub axle 12 secured in the plate 2. The pinion 11 is laterally displaced in relation to the pinion 10 so that the meshing of the two pinions 10 and 11 takes place over approximately half of the width of the teeth of the two pinions as can be seen in Fig. 4.

Mounted parallel to the shafts 4 and 7 is an auxiliary shaft 13 supported by the plates 1 and 2 in such manner as to be able to slide axially. In order to avoid excessive projection of the shaft 13 outside the machine, there is provided on the plate 1 an elongated bearing 14 which receives the corresponding end 13*a* of the shaft 13. Keyed on the shaft 13 are two pinions 15 and 16, the pinion 15 meshing with the pinion 9, and the pinion 16 being adapted to engage with one of the pinions 10 or 11. The pinions 9, 10, 15 and 16 are so dimensioned that the rotations of the shafts 4 and 7 are equal. In the example illustrated, these four pinions are equal to one another in size and spacing of teeth.

The width and the position of the pinions 15 and 16 are such that when the shaft 13 occupies its extreme right-hand position (as seen in Figure 1), the pinion 15 meshes on the extreme right-hand portion of the teeth of the pinion 9, and the pinion 16 meshes only with the pinion 10. When the shaft 13 occupies its extreme left-hand position (as seen in Figure 2), the pinion 15 meshes on the left-hand portion of the teeth of the pinion 9, the pinion 16 being in engagement only with the reversing pinion 11. The hub of the pinion 15 has a recess 15*a* corresponding to the bearing 14.

The auxiliary shaft 13 is driven through a fork 17 supported on a shaft 18 mounted in the plates 1 and 2. This fork, which can be more clearly seen in Figure 3, acts on the shaft 13 through a ring 19 keyed on the shaft. Associated with the shaft 18 is a device comprising a sleeve 20 having two grooves 21 formed with oblique flanks, which is keyed on the shaft 18, and a spring 22 secured to the plate 1. When the fork 17 is moved, the cranked end 22*a* of the spring 22 becomes lodged in one of the recesses 21, thus maintaining the mechanism in one of its operating position.

In order that the change of direction may take place when the shaft 7 has completed an integral number of revolutions, that is to say, when it occupies its inoperative position, a safety device is provided which, in the present example, consists of an angle member 23 secured to the plate 2 and co-operating with the pinion 16. As will be seen from Figures 1 and 2, the arm 23*a* of the angle member 23 is so situated in relation to the pinion 16 that this pinion lies on one side or the other of the arm 23*a* in the two operating positions of the mechanism. Formed in the periphery of the pinion 16 is a slot 24 corresponding to one tooth gap and of such dimensions that the arm 23*a* can pass through this slot. The arm 23*a* is preferably provided with a double bevel sur-

face. Because of this arrangement, the pinion 16 can be moved, and the mechanism thus reversed, only when the slot 24 is situated opposite the arm 23*a*, the pinion 16 naturally being so keyed that this coincidence occurs when the shaft 7 occupies its angular inoperative position.

The present mechanism operates as follows:—

In the position shown in Figure 1, the rotation of the shaft 7 is transmitted to the shaft 4 by the engagement of the pairs of pinions 10—16 and 15—9. Thus one revolution of the shaft 7 corresponds with one revolution of the shaft 4 in the same direction. When an integral number of revolutions has been completed, the shaft 7 returns to its inoperative position and the slot 24 is situated opposite the arm 23*a* of the angle member 23. If, at this instant, the fork 17 is actuated, the shaft 13 slides longitudinally and the pinion 16 takes up a position on the other side of the arm 23*a* in which it ceases to mesh with the pinion 10, and meshes with the pinion 11. The various elements of the mechanism then occupy the positions shown in Figure 2, in which the rotation of the shaft 7 is transmitted to the shaft 4 through the pinions 10 11, 16, 15 and 9. Now one revolution of the shaft 7 in one direction corresponds with one revolution of the shaft 4 in the opposite direction. Owing to the fact that, in its longitudinally displaced position, the pinion 16 always occupies the same angular position in relation to the pinions 10 and 11, it is advantageous to bevel the teeth in the areas 16*a* and 16*b* (Figure 4) situated respectively opposite the pinions 10 and 11, so that the passage of the pinion 16 into its positions of engagement is facilitated.

It is to be noted that the counting device cannot turn when the sliding part of the present mechanism occupies an intermediate position between the two positions described, because the movement is then blocked, because on the one hand, of the double meshing of the pinion 16 with the pinions 10 and 11, and on the other hand due to the fact that the arm 23*a* has not left the slot 24.

In the modification shown in Figures 5 to 9, the main parts are shown and designated by the same reference numerals as were used above in the description of the reversing mechanism. Mounted coaxially between the plates 1 and 2 is the shaft 4, to which the required number of revolutions is imparted in the present example by the driving device controlled by a counting device (not shown) of the machine, and the shaft 7 of the repeating drums. A wide pinion 9 and a pinion 10 are keyed on the shafts 4 and 7 respectively. The pair of reversing pinions 15—16, as in the previous example, is secured on a common shaft 13 but in the present example this shaft is hollow and forms with the two pinions a type of bobbin which can slide on a shouldered axle 25 mounted between the plates 1 and 2. An auxiliary pinion 11, in engagement over part of its width with the pinion 10, is so situated that the pinion 16 can either mesh therewith without touching the pinion 10 or mesh with the pinion 10 alone. Also associated with the pinion 16 is a stop 23 (Fig. 7) co-operating with a slot 24, which permits the direction-changing operation only when the pinion 16 has completed a complete revolution in one direction or the other. In order that one revolution of the shafts 4 and 7 may correspond with one revolution of the pinion 15 or 16, the pinions 9, 10, 15 and 16 are equal in diameter and spacing of teeth.

The direction-changing operation, that is to say, the movement of the pinions 15—16 from the position illustrated in Figure 6 (reversed drive), or *vice versa*, is performed with the aid of a lever 26 pivoting about a fixed pin 27, one of the arms of the lever extending between the pinions 15 and 16 and supporting a freely rotatable roller 28. The other arm of the lever 26 is forked as at 29 and through the arms passes a control rod or flat bar 30 to which the fork is pivotally connected. The bar 30 is guided in apertures 1*a* and 2*a* in the plates 1 and 2 and is subjected to the action of a spring 31, which tends to urge it in the direction of the arrow f_1, that is to say, in the direction corresponding to the movement of the pinions 15 and 16 into the position for reverse driving. The bar 30 is driven in the opposite direction to the arrow f_1 in a manner not shown by suitable parts of the machine to which the present direction-changing mechanism is applied.

As will be seen from Figures 8 and 9, there co-operates with the rod or flat bar 30 a second rod or flat bar 32 transversely arranged relatively to the bar 30, the rod or bar 32 sliding, in the present example, along the plate 2 on which it is mounted, for example, by pins extending through elongated apertures 32*a*. The bar has a slot 32*b* of sufficient dimensions to allow the bar 30 to pass through, and is also subjected to the action of a spring 33 which tends to return it in the direction of the arrow f_2.

The operation of the actual direction-changing mechanism is identical, except for the direction of transmission of the

movement, to that which has been described with reference to Figures 1 and 4.

The control device operates in the following manner:—

The flat bar 30 having been moved against the action of its spring 31 into the position shown in Figures 5 and 8, the bar 32 slides under the action of its spring and forms a stop for the end 30*a* of the bar 30. The direction-changing mechanism then occupies the direct-driving position. If, when the stop 23 is in register with the slot 24 and the bar 30 is thereby released, the bar 32 is moved against the action of its spring 33 at the instant when the aperture 32*b* arrives opposite the end 30*a* of the bar 30, the latter bar moves in the direction of the arrow f_1, carrying with it the lever 26, which brings the pinions 15—16 into the position corresponding to the reverse driving. The bar 32 can then be released without any of the various parts being moved, and the control process already described can be recommenced.

What we claim is:—

1. A reversing mechanism connecting the revolution counting device and repeating drums of a calculating machine comprising two pinions fast with an auxiliary shaft parallel to the shaft of the counting mechanism and adapted to move longitudinally, one of the pinions constantly meshing with a pinion fast with the shaft of the counting device and the other pinion being adapted to mesh either with a pinion keyed on the shaft of the repeating drums or with an auxiliary pinion in engagement with the latter pinion.

2. Mechanism according to Claim 1 in which the pinions supported by the auxiliary shaft and those supported by the shaft of the counting device and the shaft of the repeating drums are equal to one another in diameter and tooth spacing.

3. Mechanism according to Claim 2, in which a stop is associated with one of the pinions of the auxiliary shaft and is so arranged that the said pinion is situated on either side of the said stop in the two positions of operation of the mechanism, a slot being formed in this pinion for the passage of the stop, the pinion being fast with the auxiliary shaft and so disposed that its slot is situated opposite the stop when the shaft of the repeating drums occupies its inoperative position.

4. Mechanism according to any one of the preceding claims in which the reversing pinions are displaced by means of a rocking lever controlled by the machine in accordance with the operations to be effected.

5. Mechanism according to Claim 4 in which the rocking lever is displaced by a rod resiliently urged into one position corresponding to one of its directions of operation.

6. Mechanism according to Claim 5 in which a locking device is provided to maintain the rod in a second position.

7. Mechanism according to Claim 6, in which the locking device consists of a second rod, also resiliently urged, and which forms an abutment for the first rod when the latter occupies the second position.

8. Mechanism according to any one of the Claims 4 to 7, characterised in that the rocking lever acts on the reversing pinions through a roller positioned between the reversing pinions.

9. Mechanism according to any one of the preceding claims, characterised in that the reversing pinions are fast with a hollow shaft sliding on a pin supported by the frame of the mechanism.

10. A reversing mechanism connecting the revolution counting device and repeating drum of a calculating machine substantially as described with reference to and as illustrated by Figs. 1 to 4 or Figs. 5 to 9 of the accompanying drawings.

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Chancery Lane, London, W.C.2.

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3 SHEETS

This drawing is a reproduction of the Original on a reduced scale.

SHEET 1

Fig. 1

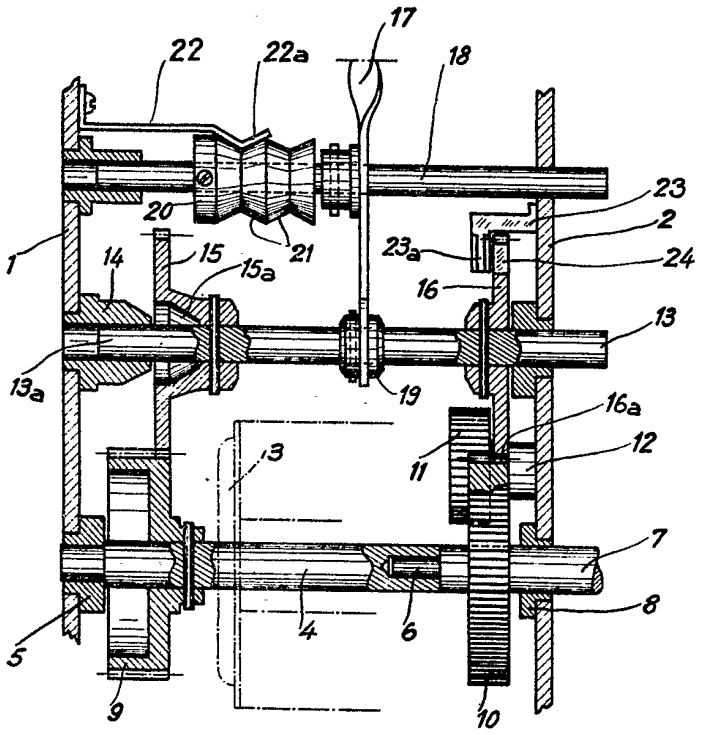


Fig. 2

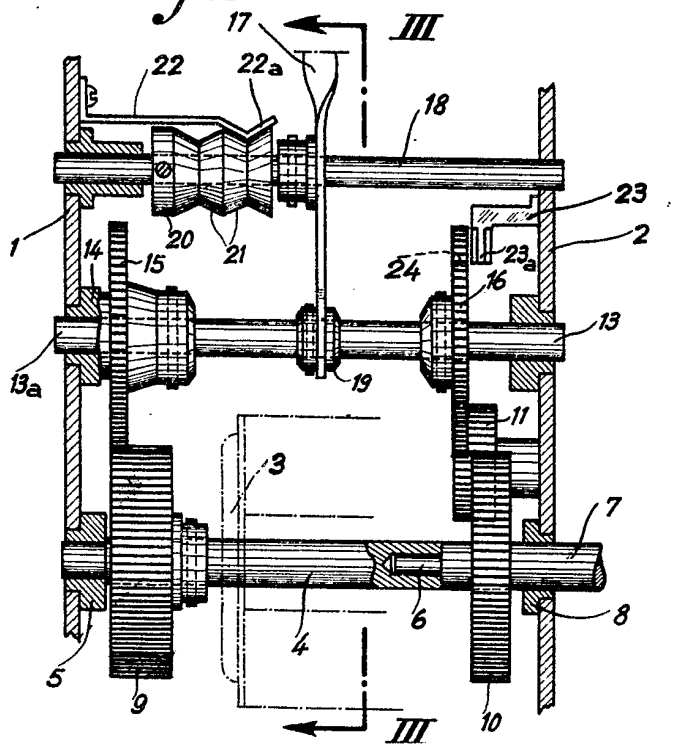


Fig. 3

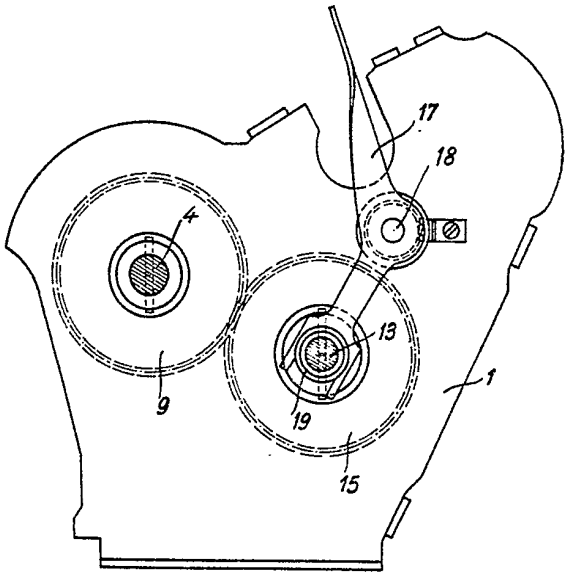


Fig. 4

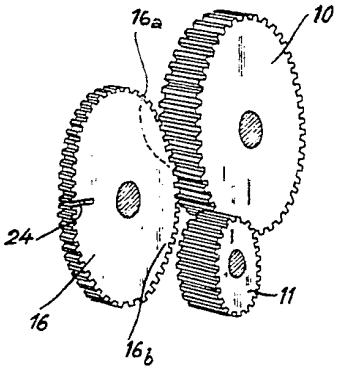


Fig. 5

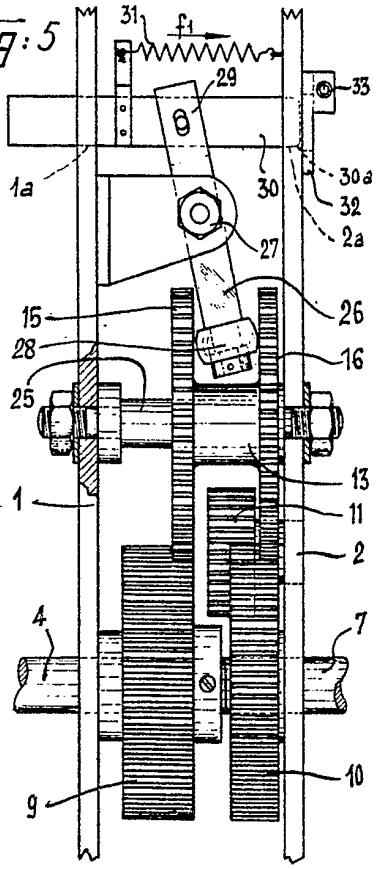
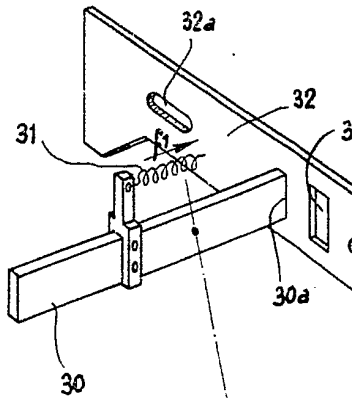


Fig. 8



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SHEETS 2 & 3

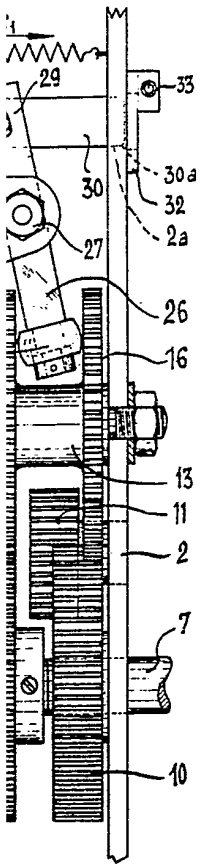


Fig. 8

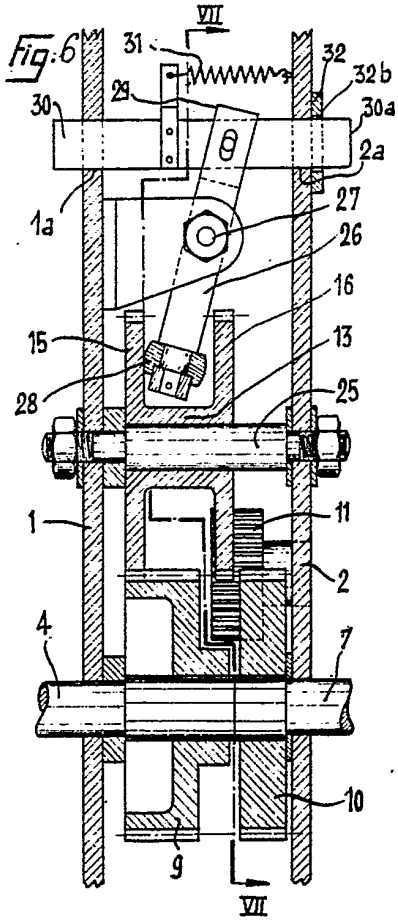


Fig. 6

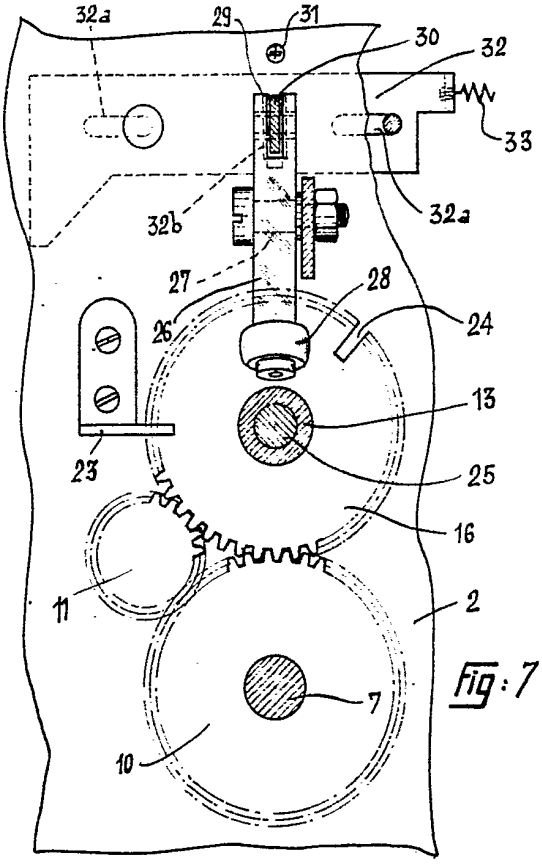
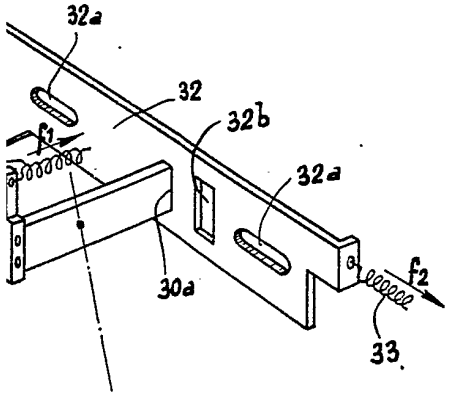
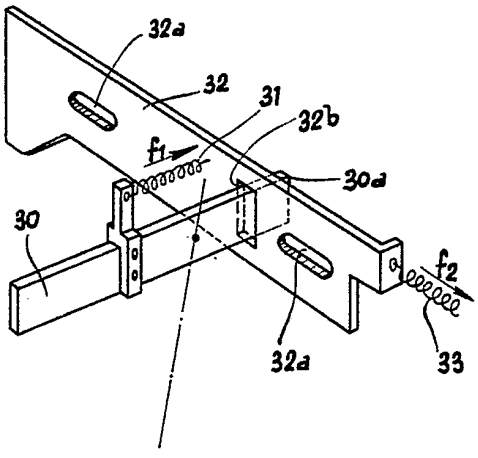


Fig. 7

Fig. 9





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SHEETS 2 & 3

Fig. 3

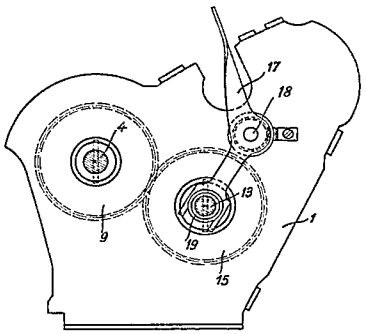

Fig. 4

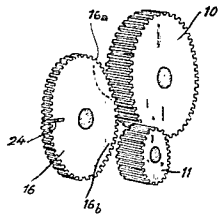

Fig. 5

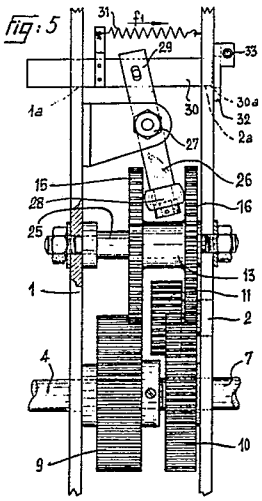

Fig. 6

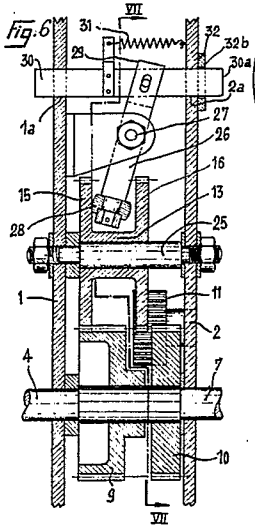

Fig. 7

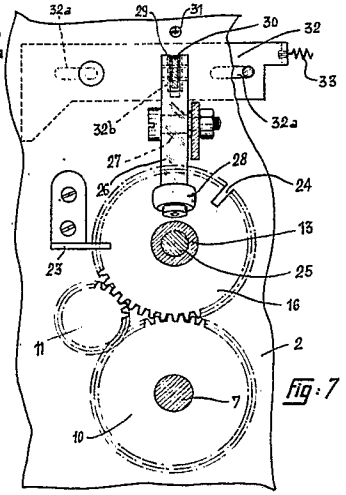

Fig. 8

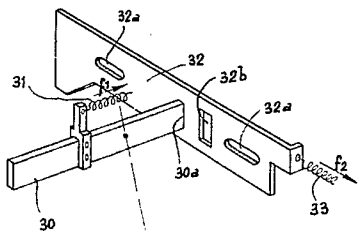

Fig. 9