Jan. 20, 1942. T. O. MEHAN 2,270,460

GOVERNOR MECHANISM FOR ADDING MACHINES

Filed Jan. 5, 1940 2 Sheets-Sheet 1

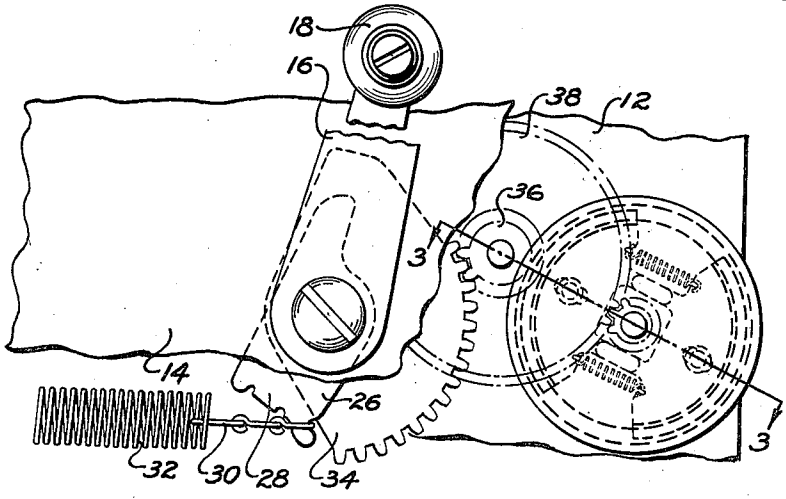

Fig. 1

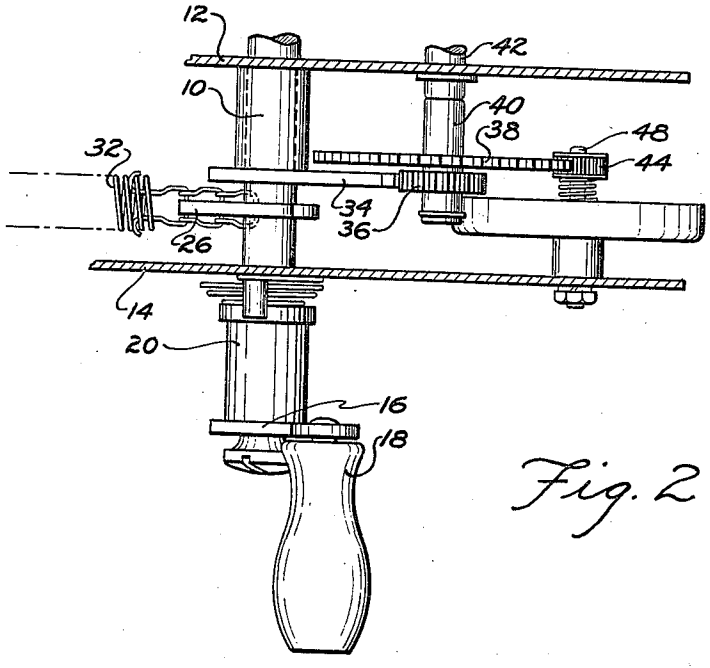

Fig. 2

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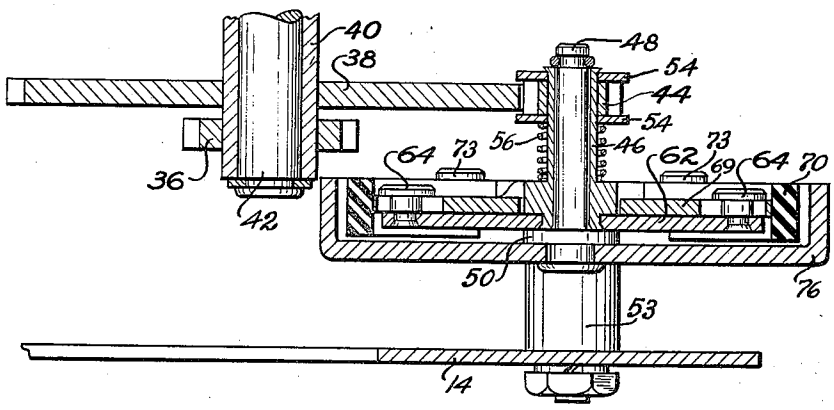

Fig. 3

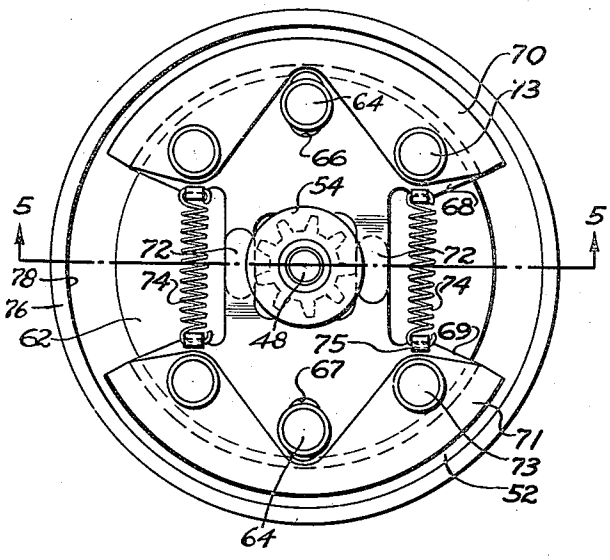

Fig. 4

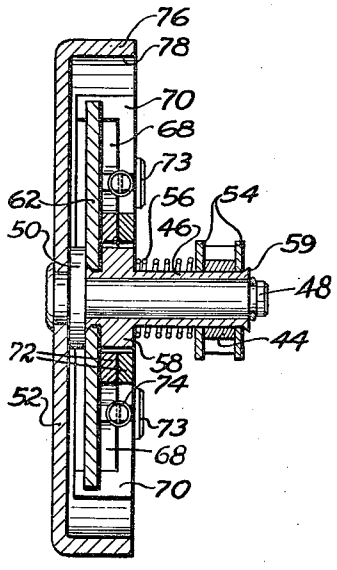

Fig. 5

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UNITED STATES PATENT OFFICE

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GOVERNOR MECHANISM FOR ADDING MACHINES

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Application January 5, 1940, Serial No. 312,611

6 Claims. (Cl. 188—185)

My invention relates generally to speed governing mechanisms, particularly for use in adding machines and similar machines in which it is desirable to control the speed of operation of an intricate mechanism deriving its power from a hand crank, or from a motor which does not operate at constant speed.

It has been customary in the past to provide adding machines with dashpots or similar controls for limiting the speed of operation of the machine. Such dashpot governors frequently became ineffective due to leakage of oil from their reservoirs, and their function was erratic due to viscosity changes in the oil resulting from differences in the ambient temperature.

It is thus an object of my invention to provide an improved adding machine drive mechanism incorporating an improved governor of a mechanical type which will operate effectively and uniformly throughout a wide temperature range.

A further object is to provide an improved governor mechanism of the centrifugal brake type, together with an improved frictional driving connection for operating the governor mechanism.

A further object is to provide an adding machine drive mechanism having a centrifugal speed governor associated therewith in a manner such that while the governor is effective to limit the speed of the driving mechanism, the momentum of the moving parts of the governing mechanism is not transmitted to the driving mechanism.

A further object is to provide an improved speed governing driving mechanism for adding machines and the like which is simple in construction, reliable in operation, and which may be economically manufactured.

Other objects will appear from the following description, reference being had to the accompanying drawings, in which:

Figure 1 is a fragmentary side elevational view of the driving mechanism of an adding machine;

Figure 2 is a plan view of the mechanism shown in Fig. 1, the frame plates of the adding machine being shown in section;

Figure 3 is an enlarged sectional view taken on the line 3—3 of Fig. 1, showing the parts to an enlarged scale;

Figure 4 is an enlarged side elevational view of the centrifugal governor; and,

Figure 5 is a transverse sectional view of the governor taken on the line 5—5 of Fig. 4.

While the centrifugal governor and driving mechanism of my invention may, of course, be utilized for the control of the speed of operation of many other types of machines, it is particularly adapted for use in conjunction with adding machines, for controlling the speed of oscillation of the main operating shafts thereof. As adding machines are generally constructed, all of the operations of the multitude of parts are controlled by and derive their power from a main shaft which is usually oscillated through an angle of 90° to 120°, one complete operation of the adding machine resulting from a forward and return stroke of the main shaft.

For the purpose of illustration herein, a main shaft 10 is shown as being supported by a pair of frame plates 12, 14. The shaft 10 is adapted to be oscillated by means of a bushing 20 and through a suitable well-known one-way resilient driving connection (not shown) is coupled to the main shaft 10. The main shaft 10 has an arm 26 secured thereto, the lower end of the arm forming a sprocket-like extension 28 for engagement with a chain 30, the chain having attached thereto one end of the main shaft return spring 32, the other end of which is suitably anchored to the frame of the machine. Thus, upon the forward (counterclockwise) stroke of the operating handle 18, the main shaft will be oscillated counterclockwise and the spring 32 placed under tension sufficient to return the main shaft to its normal position and operate the mechanism of the adding machine during such return stroke.

Rigidly secured to the main shaft 10 is a gear segment 34 which meshes with a pinion 36. The pinion 36 is secured to a gear 38, both of which are fixed to a sleeve 40 mounted for free rotation upon the reduced diameter end portion of a fixed shaft 42. The gear 38 meshes with a pinion 44 which is freely rotatable upon a sleeve 46. The sleeve 46 is mounted for free rotation upon a stub shaft 48, the shaft 48 having a flange 50 and being peened to the governor housing 52. The governor housing 52 is secured to the frame plate 14 by one or more bolts 53. The pinion 44 has friction washers 54 upon either side thereof, while a compression coil spring 56 is confined between an enlarged diameter portion 58 of the sleeve and the inner washer 54, thereby pressing the outer washer 54 against a peened shoulder 59 at the end of the sleeve. As a result, the spring 56 presses the outer washer 54 against the shoulder 59 at the end of the sleeve 46 so that slippage may take place between the pinion 44 and the sleeve 46. Thus, the pinion 44 and the

sleeve 46 may rotate relative to one another, but such relative movement does not take place during the major part of the operating cycle, since the resilient and frictional driving connection between the pinion 44 and sleeve 46 is capable of transmitting the torque encountered during the greater part of the stroke. However, when the pinion 44 has a large torque suddenly applied thereto, or when the motion of the pinion is rather suddenly arrested, as at the beginning and at the end of the operating stroke, such relative movement between the pinion 44 and its sleeve 46 may take place.

The sleeve 46 has rigidly secured thereto a plate 62 which has a pair of shouldered guide studs 64 riveted thereto. These studs project through elongated slots 66, 67 formed in plates 68, 69, respectively, the weights having shoes 70, 71 secured thereto by rivets 73. These shoes may be made of any suitable material, preferably a plastic, such as Bakelite. The plates 68, 69 have overlapping guide tongues 72 formed thereon surrounding the enlarged diameter portion 58 of the sleeve 46. The plates 68 and 69 are normally held in engagement with the enlarged portion 58 of the sleeve 46 by a pair of tension springs 74 which are secured to suitable ears 75 formed on the plates 68, 69. The casing 52 has a flange 76 having a suitably finished inner cylindrical surface 78 adapted to be engaged by the shoes 70 and 71.

In operation, upon swinging the operating handle 18 forwardly (counterclockwise), the gear segment 34 will, through the pinion 36, gear 38, and pinion 44, rotate the latter at a relatively high speed due to the speed increasing ratio of this gear train. If it is attempted to bring the handle forwardly too rapidly, the sleeve 46 will be rotated at such high speed that the shoes 70 and 71 will be pressed against the surface 78 of the casing due to centrifugal action, and apply a retarding torque to the sleeve, and hence, through the frictional driving connection and pinion 44, to the gear train and main drive shaft. Because of the relatively great mechanical advantage of the gear train, this retarding torque on the pinion 44 is greatly multiplied in its effect as a torque upon the main shaft 10, resisting forward movement of the operating handle at excessive speed.

At the end of the forward stroke of the operating handle, the centrifugal weights of the governor may be rotating at high speed, and as the forward stroke of the operating handle is arrested suddenly, the momentum of the rotating parts of the governor mechanism would be applied as a heavy torque upon the gear train. The main purpose of the resilient and frictional connection between the sleeve 46 and pinion 44 is to prevent the transmission of this high torque to the gearing. If, for example, the pinion 44 were rigidly connected to the rotating parts of the governing mechanism, torque due to the momentum of the rotating parts transmitted from these parts through the pinion 44, gear 38, pinion 36, to the segment 34, would be immensely multiplied so that the teeth on the segment 34 and pinion 36 would have to be impracticably large, or they would be broken. The momentum of the rotating parts of the governor mechanism transmitted as a torque through the frictional connection between the sleeve 46 and pinion 44 serves a useful purpose in causing a momentary pause at the end of the forward stroke, delaying the commencement of the return stroke. This pause insures that the printing hammers and similar parts of the adding machine which operate just prior to the completion of the forward stroke of the operating handle shall have adequate time to complete their respective operations.

Upon the return stroke of the main shaft, when the adding machine is being operated by the energy stored in the return spring 32, the governing mechanism operates in the same manner as previously described to limit the speed of the return stroke. Likewise, at the end of the return stroke, the resilient and frictional driving connection between the sleeve 46 and the pinion 44 provides a means for the harmless dissipation of the energy of momentum contained in the rotating parts of the governing mechanism as the main shaft comes to rest at its normal position.

While the amount of friction available to provide a driving torque between the pinion 44 and sleeve 46 is not very great, the fact that this frictional driving connection is at the high speed end of the gear train, multiplies its effectiveness as a means for applying a retarding torque to the main operating shaft.

As an example of gear ratios which may be suitable, the sizes of the segment 34, pinion 36, gear 38, and pinion 44 may be such that the latter has an angular speed about thirty times as great as that of the main shaft 10.

While I have shown and described a particular form of my invention, it will be apparent to those skilled in the art that numerous variations and alterations may be made without departing from the underlying principles thereof. I therefore desire, by the following claims, to include within the scope of my invention all such modifications and variations by which substantially the results of my invention may be obtained by the use of substantially the same or equivalent means.

I claim:

1. In an adding machine or the like having an oscillatory main shaft, means for controlling the speed of oscillation of said shaft comprising, a centrifugal governor mechanism, a speed increasing gearing connecting said main shaft with said centrifugal governing mechanism, said gearing including a frictional driving connection at the high speed end thereof.

2. In an adding machine or the like having an oscillatory main operating shaft, means to control the speed of oscillation of said shaft comprising, a governor casing, a member rotatable with respect to said casing, means on said member mounted for radial movement toward said casing for frictional engagement therewith, resilient means normally holding said elements spaced from said casing, a pinion for driving said member, a frictional driving connection between said pinion and said member, and a speed increasing gear train between said main shaft and said pinion.

3. In an adding machine, the combination of an oscillatory main operating shaft, a centrifugal speed governing mechanism, a speed increasing gear train forming a driving connection between said main shaft and said mechanism, and a frictional driving means connecting the high speed end of said gear train with said governor mechanism.

4. In combination, an adding machine having an oscillatory main operating shaft, and a handle for oscillating said shaft, means for prevent-

ing oscillation of said shaft at an excessive speed, comprising, a centrifugal braking mechanism operable to apply a retarding torque when operated at a speed exceeding a predetermined maximum, frictional means for driving said centrifugal braking mechanism, and a gear train connecting said main operating shaft and said frictional means, said gear train causing rotation of said frictional driving means at an angular speed in the order of thirty times the angular speed of the main operating shaft.

5. In an adding machine or the like having an oscillatory main operating shaft, means to control the speed of oscillation of said shaft comprising a governor casing having an internal cylindrical braking surface, a member rotatable with respect to said casing, metal elements on said member mounted for outward radial movement, non-metallic shoes on said elements for frictional engagement with said cylindrical surface, resilient means normally holding said elements out of engagement with said casing, a pinion, a slipping frictional driving connection between said pinion and said member, said connection affording sufficient friction to cause said pinion to drive said member and parts carried thereby when said pinion is accelerated at a normal rate and to cause said pinion to slip relative to said member when said pinion is suddenly accelerated or arrested, and a speed increasing gear train between said main shaft and said pinion.

6. In an adding machine or the like having an oscillatory main operating shaft, means to control the speed of oscillation of said shaft comprising a governor casing having a braking surface, a sleeve rotatable with respect to said casing, a plate secured to said sleeve, a pair of weights mounted on said plate for radial sliding movement toward said braking surface for frictional engagement therewith, resilient means normally holding said weights out of engagement with said casing, a pinion for driving said member, a resilient frictional driving connection between said pinion and said member, and a speed increasing gear train between said main shaft and said pinion.

THOMAS O. MEHAN.