July 6, 1965 J. MEIER 3,193,030

BALANCE

Filed March 12, 1964 2 Sheets-Sheet 1

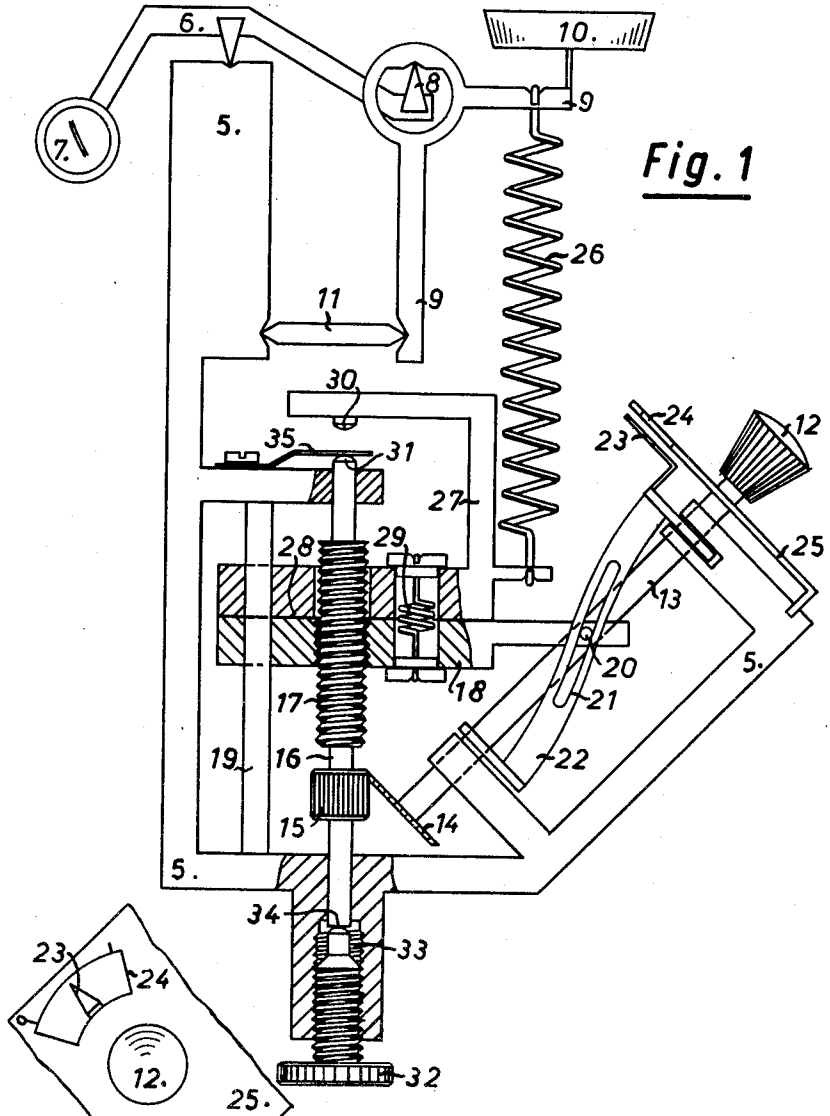


Fig. 1

Fig. 2

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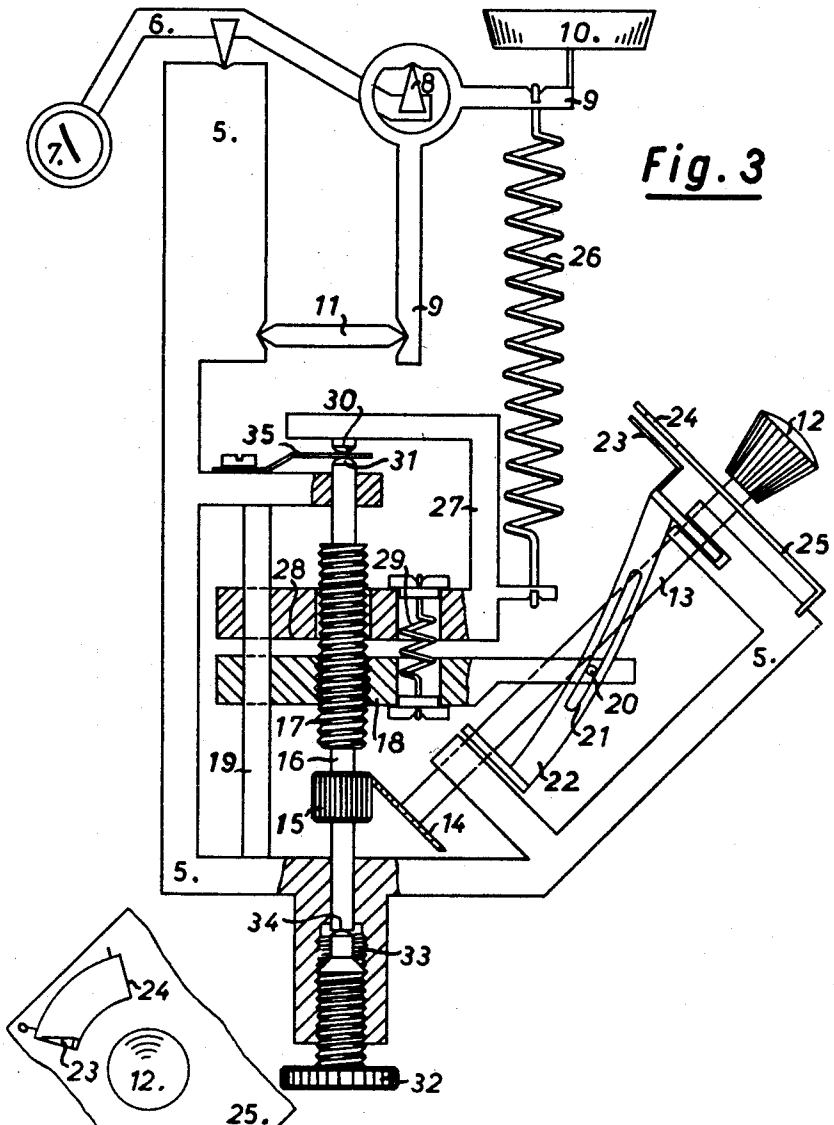


Fig. 3

Fig. 4

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BALANCE

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This invention relates to a balance which has a taring device and a device for adjusting the zero point of the balance, the balance comprising a balance frame, a balance beam fulcrumed on said balance frame, and a pan carrier seated on a knife edge provided on one arm of said balance beam.

An object of the invention is a balance of the type stated and having a taring device including a leadscrew mounted in the balance frame both for rotation and for axial displacement, manually operable tare adjusting means for rotating said leadscrew, a travelling nut on said leadscrew and means for preventing a rotation of said nut, a tensioning member movably mounted on said balance frame in a manner that it is able to follow the movement of said travelling nut, a taring spring acting between said pan carrier and said tensioning member, a first abutment on said tensioning member by means of which it contacts said travelling nut when the taring device is adjusted to effect a taring, a second abutment on said tensioning member by means of which it contacts said leadscrew in an axial direction when said taring device is adjusted to its zero position in which said first abutment does no more contact said travelling nut, and said, device for adjusting the zero position of said pan carrier including manually operable means for adjusting the axial position of said leadscrew with respect to said balance frame. In a preferred construction of such a balance the taring device has an indicating member whose position is dependent on that of said travelling nut and thus indicating the setting of the taring device. Preferably, said indicating member is rotatably mounted on a shaft which is in turn rotatably mounted in the balance frame, and wherein a rotary knob for adjusting the taring device is fixed on said shaft which can rotate said leadscrew through a gearing, and wherein a pin and slot drive is arranged so as cause the indicating member to rotate in accordance with the displacement of said travelling nut. A still further object of the invention is a balance of the kind outlined wherein said device for adjusting the zero position of the pan carrier and of the balance beam includes a set screw of fine pitch which can be driven into a thread in the balance frame axially of the leadscrew of the taring device and which presses directly onto a front face of the leadscrew in order to alter the axial position of the latter.

These and other objects of the invention will best be understood from the following description of a specific embodiment when read in connection with the accompanying drawing in which:

FIG. 1 is a simplified view of the taring device and of the device for adjusting the zero point of the balance, the taring device being set for a taring operation;

FIG. 2 is a plan view of the front plate of the taring device with its indicating member in the same position as in FIG. 1;

FIG. 3 shows the taring device of FIG. 1 with the device adjusted to remove the taring effect and in its zero position, and

FIG. 4 is a plan view of the front plate of the taring device with its indicating member in a position corresponding to that of FIG. 3.

In FIGS. 1 and 3 the balance beam **6** is fulcrumed as

usual on the balance frame **5**, which is only diagrammatically indicated. On one arm of the balance beam **6** there is a counterweight **7** and on the other arm an outer knife edge **8** on which the pan carrier **9** is supported or seated. The pan carrier **9** has the scale pan **10** mounted eccentrically and is guided by a steering lever **11**.

The taring device is actuated by means of the operation knob **12** fixed to a drive shaft **13** which is rotatably mounted in the balance frame **5** and which also carries a toothed wheel **14**. The toothed wheel **14** is permanently in engagement with the pinion **15** of a leadscrew **16**, which is mounted in the balance frame **5** both for rotation and for axial displacement. The thread **17** of the leadscrew **16** is engaged by a travelling nut **18** guided by a rod **19** which is rigidly fixed in the balance frame **5**. Fixed to the arm jutting out of the travelling nut **18** is the guide pin **20** of a pin and slot drive engaging in the spirally curved groove **21** of the curved member **22**, the latter being rotatably mounted on the shaft **13**. The curved member **22** is provided with a pointer **23** which can be seen through the sectorial window **24** in the front plate **25**. The front plate **25** is fixed on the balance frame **5** and the sectorial window **24** is concentric with the operating knob **12**, as shown in FIGS. 2 and 4. The whole arrangement is such that the position of the pointer **23** relatively to the window **24** is a measure of the taring and thus shows the adjustment of the taring device. For this purpose graduation lines may be provided at the edge of the window **24**, the bottom left-hand line, for example, being marked with a zero to indicate the zero position of the taring device.

The taring spring **26** on one side engages the pan carrier **9** and one the other side engages a tensioning member **27**, which is guided parallel to the leadscrew **16, 17** by the rod **19** and by the leadscrew **16, 17** and which is displaceable axially of the latter. The tensioning member **27** has an abutment **28** enabling it to contact the travelling nut **18** under the influence of a retaining spring **29**. The tension retaining spring **29** must be able to overcome the effect of the taring spring **26** and press the tensioning member **27** against the travelling nut **18**. The tensioning member **27** finally has an additional abutment **30** located in an extension of the axis of the leadscrew **16, 17** and opposite its top end face **31**.

The device for adjusting the zero point of the pan carrier **9** and of the balance beam **6** uses a set screw **32** of relatively fine pitch, which can be driven into the thread **33** in the balance frame **5** axially of the leadscrew **16, 17** and which presses directly onto the bottom face **34** of the latter. In order to ensure that the bottom face **34** of the leadscrew **16, 17** always bears on the set screw **32**, a leaf spring **35** is provided to overcome the effect of the taring spring **26** and to urge the leadscrew **16, 17** downwards. In FIGS. 1 and 3 the leaf spring **35** presses onto the top face of the leadscrew **16, 17**, although the desired effect could also be obtained if it acted on an other part of the leadscrew.

In the embodiment in FIGS. 1 and 3 the taring spring **26** draws the pan carrier **9** downwardly. So if the weight of a container placed on the scale pan **10** is to be tared, the tension exerted by the taring spring **26** must necessarily be correspondingly diminished; hence the taring spring **26** has to be slackened accordingly and the operating knob **12** turned in a direction such that the travelling nut **18** and thus the tensioning member **27** move the requisite distance upwards This adjustment of the taring device is shown in FIGS. 1 and 2, the pointer **23** in FIG. 2 moving clockwise and upwardly corresponding to the weight of the container or article to be tared. If the pointer **23** moves beyond the top right-hand limit of the window **24**, a control weight has to be

operated to keep the pointer within the sector bounded by the window 24.

To stop the taring effect when the article in question has been removed, the knob 12 has to be turned in the opposite direction so that the travelling nut 18 and the tensioning member 27 move downwardly. As soon as the pointer 23 approaches the zero line in the bottom left-hand portion of the window 24, the abutment 30 of the tensioning member 27 will come to a standstill on the leaf spring 35 and thus on the top face 31 of the leadscrew, and at this moment the zero position of the taring device is reached. However, the pointer 23 need not be read at all accurately for this purpose; instead, the knob 12 is turned on in the same direction until the pointer 23 is right at the other side of the zero line, as shown in FIG. 4. As the tensioning member 27 is stopped at the top face 31 of the leadscrew 16, 17 by means of its abutment 30 and of the leaf spring 35 when the knob 12 is turned on in this way, the resultant tension exerted by the taring spring 26 remains constant and only the travelling nut 18 will continue to move downwardly, so that the retaining spring 29 is now tensioned. The resultant position of the various parts of the taring device is shown in FIG. 3, wherein the travelling nut 18 has descended away from the abutment 28 of the tensioning member 27. FIG. 3 shows the zero position of the taring device and it is quite immaterial how far away the abutment 28 of the tensioning member 27 is from the travelling nut 18. Thus no special attention and no accurate reading of the position of the pointer 23 are required to obtain the zero position of the taring device; it is sufficient for the pointer 23 to have been moved slightly beyond the zero mark as shown in FIG. 4.

In the zero position shown in FIGS. 3 and 4 the zero point of the balance beam 6 and of the pan carrier 9 can be adjusted, and for this purpose the set screw 32 is displaced. The displacement of the set screw 32 slightly alters the axial position of the leadscrew 16, 17 and this alteration is transferred through the leaf spring 35 to the abutment 30 and thus to the tensioning member 27. The tensile effect of the taring spring 26 itself varies accordingly, and this brings the balance beam 6 into the zero position of the balance. In the course of the adjustment of the zero position of the balance beam by means of the set screw 32 the distance between the travelling nut 18 and the abutment 28 of the tensioning member 27 remains the same; however, the travelling nut 18 follows the axial displacement of the leadscrew 16, 17 relatively to the frame 5 of the balance, so that the zero-point correction is recorded by a corresponding displacement of the pointer 23 within the window 24. If the displacement of the pointer 23, which is normally only slight, turns out to be inadmissibly large, this is an immediate indication of an incorrect operation of the balance, which must be avoided. For normal adjustment of the zero point of the balance beam 6 the pointer should move only between the zero mark and the adjacent lower edge of the window 24.

The balance described is thus extremely simple to operate, and all adjustments made—regardless of whether the balance is tared or whether the zero-point of the balance beam 6 is adjusted—can be seen at a glance from the resultant position of the pointer 23. Moreover, apart from the taring spring 26 no other devices, such as optical compensating means or an additional spring specially for the correction of the zero point of the balance are required, so that these potential sources of errors are eliminated and operating reliability is is improved.

The functioning of the balance is fundamentally the same in respect of the adjustment of the taring and of the zero-point of the balance if, in contrast to FIGS. 1 and 3, the top of the taring spring 26 is suspended from the tensioning member 27 and the bottom of the taring spring from the pan carrier 9, or in other words, if the pan carrier 9 is below the travelling nut 18. In this case the taring spring 26 tends to raise the pan carrier 9, and this tendency has to be compensated for by having a correspondingly smaller counterweight 7 on the beam 6. The raising of the tensioning member 27 then increases the pull of the taring spring 26, and in a balance of this construction both the retaining spring 29 and the leaf spring 35 may be omitted, since the taring spring 26 itself takes over the functions required of them. In this modification the taring spring 26 is at its lowest tension when the taring device is in its zero position. The device described is accordingly very adaptable and can be used in various types of balances. These and other modifications which may occur to those familiar with the art fall within the spirit and scope of the invention as set forth in the following claims.

I claim:

1. A balance having a taring device and a device for adjusting the zero position of the balance, the balance comprising a balance frame, a balance beam fulcrumed on said balance frame, and a pan carrier seated on a knife edge provided on one arm of said balance beam, said taring device including a leadscrew mounted in the balance frame both for rotation and for axial displacement, manually operable tare adjusting means for rotating said leadscrew, a travelling nut on said leadscrew and means for preventing a rotation of said nut, a tensioning member movably mounted on said balance frame in a manner that it is able to follow the movement of said travelling nut, a taring spring acting between said pan carrier and said tensioning member, a first abutment on said tensioning member by means of which it contacts said travelling nut when the taring device is adjusted to effect a taring, a second abutment on said tensioning member by means of which it contacts said leadscrew in an axial direction when said taring device is adjusted to its zero position in which said first abutment no longer contacts said travelling nut, and said device for adjusting the zero position of said balance beam and said pan carrier including manually operable means for adjusting the axial position of said leadscrew with respect to said balance frame.

2. The invention as recited in claim 1, wherein said device for adjusting the zero position of said balance beam and said pan carrier includes a set screw of fine pitch which can be moved axially of the leadscrew of said taring device in a thread provided in said balance frame, said set screw being arranged to engage an adjacent end of said leadscrew.

3. The invention as recited in claim 2, wherein said set screw engages the end of said leadscrew opposite to that engaged by said second abutment of said tensioning member.

4. The invention as recited in claim 1, wherein said taring device and said device for adjusting the zero position of said balance beam have a common indicating member whose position is dependent on that of said traveling nut.

5. The invention as recited in claim 4, wherein said indicating member is rotatably mounted on a shaft which is in turn rotatably mounted in said balance frame, a rotary knob for manually adjusting said taring device is fixed on said shaft, a gearing is provided acting between said shaft and said leadscrew, and wherein a pin and slot drive is arranged so as to cause said indicating member to rotate in accordance with the displacement of said travelling nut.

6. The invention as recited in claim 1, wherein the upper end of said taring spring is acting on said pan carrier and the lower end of said taring spring is acting on said tensioning member, a retaining spring is provided for holding together said tensioning member and said travelling nut, and a leaf spring is provided to overcome the effect of said taring spring and to urge said leadscrew downwards.

7. The invention as recited in claim 6, wherein said means for adjusting the axial position of said leadscrew

with respect to said balance frame are acting on the lower front face of said leadscrew.

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LEO SMILOW, *Primary Examiner.*