BRITISH PATENT

NO. 1059099 (24513/64)

DATED 13th September, 1965

TITLE: Improvements in calculating devices.

GRANTEE: LIONEL BERNSTEIN.

(Assignments, Licences, Mortgages or other documents affecting the patent rights, should be registered at the Patent Office within six months of execution.)

TERM: *16 years from* 13th September, 1965

RENEWAL FEES: *To maintain the patent in force, renewal fees must be paid annually, on and after*

13th September, 1969

(We usually send a reminder of renewal fees falling due but do not guarantee to do so :

MARKING: *The patented articles should be marked* "Patent No. 1059099 ".

PATENT RIGHTS: *On and after* 7th June, 1970 *the Comptroller may make a compulsory licence order if an interested party applies to him and establishes that the patent rights have been abused or the invention is not being sufficiently worked. The risk of this is difficult to eliminate but at least an endeavor should be made to ensure that the invention is worked in the United Kingdom with as little delay as possible and to the fullest extent that is reasonably practicable.*

There are special provisions relating to patents for foods, medicines and surgical devices.

CARPMAELS & RANSFORD,
Chartered Patent Agents,
24, Southampton Buildings,
Chancery Lane, London, W.C.2.

Patent No. 1059099

Elizabeth the Second by the Grace of God of the United Kingdom of Great Britain and Northern Ireland and of Her other Realms and Territories Queen, Head of the Commonwealth, Defender of the Faith: To all to whom these presents shall come greeting:

WHEREAS Lionel Bernstein, a citizen of the Republic of South Africa, of 154 Regent Street, Observatory, Transvaal Province, Republic of South Africa, _____

(hereinafter referred to as the said applicant) hath prayed that a patent may be granted unto him for the sole use and advantage of an invention for Improvements in calculating devices, _____

AND WHEREAS the said applicant (hereinafter together with his executors, administrators, and assigns, or any of them referred to as the patentee) hath declared that there is no lawful ground of objection to the grant of a patent unto him:

AND WHEREAS the complete specification has particularly described the invention:

AND WHEREAS We, being willing to encourage all inventions which may be for the public good, are graciously pleased to condescend to his request:

KNOW YE, THEREFORE, that We, of our especial grace, certain knowledge, and mere motion do by these presents, for Us, our heirs and successors, give and grant unto the said patentee our especial licence, full power, sole privilege, and authority, that the said patentee by himself, his agents, or licensees, and no others, may subject to the conditions and provisions prescribed by any statute or order for the time being in force at all times hereafter during the term of years herein mentioned, make, use, exercise and vend the said invention within our United Kingdom of Great Britain and Northern Ireland, and the Isle of Man, and that the said patentee shall have and enjoy the whole profit and advantage from time to time accruing by reason of the said invention during the term of sixteen years from the date hereunder written of these presents: AND to the end that the said patentee may have and enjoy the sole use and exercise and the full benefit of the said invention, We do by these presents for Us, our heirs and successors, strictly command all our subjects whatsoever within our United Kingdom of Great Britain and Northern Ireland, and the Isle of Man, that they do not at any time during the continuance of the said term either directly or indirectly make use of or put in practice the said invention, nor in anywise imitate the same, without the consent, licence or agreement of the said patentee in writing under his hand and seal, on pain of incurring such penalties as may be justly inflicted on such offenders for their contempt of this our Royal command, and of being answerable to the patentee according to law for his damages thereby occasioned:

PROVIDED ALWAYS that these letters patent shall be revocable on any of the grounds from time to time by law prescribed as grounds for revoking letters patent granted by Us, and the same may be revoked and made void accordingly: PROVIDED ALSO that nothing herein contained shall prevent the granting of licences in such manner and for such considerations as they may by law be granted: AND lastly, We do by these presents for Us, our heirs and successors, grant unto the said patentee that these our letters patent shall be construed in the most beneficial sense for the advantage of the said patentee.

IN WITNESS whereof We have caused these our letters to be made patent as of the thirteenth day of September e thousand nine hundred and sixty-five and to be sealed

Gordon Grant

Comptroller-General of Patents,
Designs, and Trade Marks.

PATENT SPECIFICATION

DRAWINGS ATTACHED

Inventors: LIONEL BERNSTEIN and JOHN CHARLES WILLIAMS

1,059,099

Index at acceptance: —G4 B5D

Int. Cl.: —G 06 d

COMPLETE SPECIFICATION

Improvements in Calculating Devices

I, LIONEL BERNSTEIN, a citizen of the Republic of South Africa, of 154 Regent Street, Observatory, Transvaal Province, Republic of South Africa, do hereby declare
5 the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement: —

10 This invention relates to calculating devices and more particularly to devices using a logarithmic scale.

The accuracy of a slide rule having the normal sub-divisional logarthmic scale mark-
15 ing decreasing along the length of the scales on the rule is dependent to a large extent upon the length of the rule, which is limited by practical considerations. Cylindrical rules have been made to increase the scale lengths
20 but in general these rules are cumbersome and often difficult to manipulate.

It is the object of the present invention to provide a calculator having logarithmic scales which may be made with elongated
25 scales while the overall size of the calculator is kept to a minimum.

Calculating devices have been proposed which comprise a pair of tapes graduated to form the scales of a slide rule, the tapes being
30 carried on spools mounted in a housing and positioned parallel to each other, means being provided for moving both tapes independently of each other or in unison in either longitudinal direction past the datum line.

35 This principle does not appear to have been widely adopted, and it would seem that the principle objections are the difficulty of providing a convenient operating mechanism to drive the tapes, and of maintaining a con-
40 stant tension in said tapes. A further object of the invention is to overcome these difficulties.

According to the invention in a calculating device of the type described, the tapes are drivable by sprockets or like positive drive members rotatably mounted all on a common 45 drive shaft, drive being transmitted from the drive shaft to the drive members through a clutch mechanism through which any one or all the drive members may be driven by the drive shaft. 50

Preferably the clutch mechanism comprises a friction disc fast on the drive shaft and situated between two drive members each associated with a graduated tape, the drive members being urged against the disc by 55 spring pressure, means being provided by which either drive member may be displaced along the shaft away from the disc.

According to a further feature of the invention each tape has one end attached to a 60 drum on which it may be wound to form a spool, and passes via the drive mechanism to a second drum upon which the other end of the tape is wound to form a second spool, the drums being mechanically connected through 65 a gear train and a preloaded spring whereby a constant tension is applied to the tape by the drums, variations in the diameters of the spools through the tape passing from one to the other being compensated for by the 70 consequent change of tension in the spring.

The invention is described with reference to the drawings accompanying the provisional specification in which:

Fig. 1 is a diagrammatic illustration of the 75 operation of the drive mechanism.

Fig. 2 is a diagrammatic illustration of the operation of tensioning mechanism.

Fig. 3 is a side elevation of the calculator with one side plate removed for clarity. 80

Fig. 4 is a plan view of the calculator

showing a part section along the line AA (Fig. 3).

Fig. 5 is a part side elevation of the calculator.

Fig. 6 is an end elevation.

Referring to Fig. 1, two perforated tapes 22, 22' having logarithmic scales pass over sprockets 6, 6' mounted for free rotation upon a shaft 8. The sprockets 6, 6' are urged by springs 30, 30' against a disc 31 fast on the shaft 8 and provided with facings 32, 32' of friction material. A lever 23 (Fig. 5) may be moved to any of three alternative positions, in one position disengaging the sprocket 6 from the disc 31 against the pressure of the spring 30, at another position disengaging the sprocket 6' from the disc against the pressure of the spring 30', and at an intermediate position allowing both sprockets to remain in contact with the disc.

In figure 2 the tape 22 is shown spooled onto the drums 11 and 15, the tape being driven by the sprocket 6. The drum 11 is fast to a rotatably mounted gear wheel 12, whilst the drum 15 is connected to a gear 26 through a spiral spring diagrammatically indicated at 18. The two gears mesh with a common idler gear 14, rotation of gear 12 thus producing a corresponding rotation of gear 26. The spring 18, which is pretensioned, acts on the drum 15 to create a suitable tension in the tape 22. As the tape passes from one spool to the other, the first spool will become smaller in diameter whilst the second spool increases in diameter causing, as a result of the gear train 12, 14, 26, the gear 26 to move relative to the drum 15 thus altering the tension in the spring 18 and compensating for the alternation in the tap tension which would otherwise occur as a result of the change in diameter of the spool on drum 15.

An embodiment of the calculator of the invention is illustrated in figs. 3—6. The mechanism is contained within two elongated side plates 1 between which extend the various shafts carrying two moving parts of the mechanism. The tapes 22, 22' are wound at one end on the spools 15, 15' from which they pass over the idlers 19, 19' the drive sprockets 6, 6' and back to the spools 11, 11' onto which the other ends of the tapes are wound.

The drive sprockets 6, 6' are journalled for free rotation on the shaft 8, a disc 31 carrying facings 32, 32' of friction material being fast to the shaft 8 between the sprocket 6 and sprocket 6', springs 30, 30' urging the sprockets against the facings. At one end of the shaft 8 is a gear 7 fast to the shaft and meshing with a gear 20 driven by a knob 24 on the exterior of the machine. A shaft 9 carries forks 4, 4' on a multistart thread, so that rotation of the shaft causes lateral displacement of the forks which are restrained against rotation by a crossbar 10. The open ends of the forks engage circumferential grooves 34, 34' in the sprockets 6, 6' the grooves being somewhat wider than the forks, which are positioned so that they normally lie close to the outer sides of the grooves. Rotation of the shaft 9 by means of the external lever 23 in one direction will thus cause the fork 4 to bear against the outer side of the groove 34 and force the sprocket 6 away from the facing 32 against the pressure of the spring 30, whilst the fork 4' moves towards the inner side of the groove 34' without exerting pressure on the sprocket 6'. Disengagement of the sprocket 6' from the facing 32' is achieved by rotating the shaft 9 in the opposite direction.

Since the tensioning mechanism for each of the two tapes is identical, only that for tape 22 is described. A drum 11 carries wound about it a portion of the tape 22 to form a spool, the tape passing through the drive mechanism and back to the spool formed by the remainder of the tape wound on a drum 15 the two drums being journalled for rotation on shafts 35 and 17 respectively. The drum 15 is formed with a cylindrical recess 36 to the circumferential surface of which is attached one end of a spiral spring 18, the other end of which spring is attached to the shaft 17. Fast to the drum 11 and to the spindle 17 are gears 12 and 26, both of which mesh with an idler 14. The arrangement functions as described with reference to figure 2.

Between the idlers 19, 19' and the drive sprockets 6, 6' the tapes pass beneath a window 25, provided with a datum line 38, in an end plate 39 fixed to the side plates 1, 1'.

The operation of the calculator is similar to that of an ordinary slide rule, except that instead of having a moving scale, a stationary scale, and a moving cursor, both scales are movable, and instead of the cursor a static datum line is provided. The scales may be set individually by turning the lever 23 to either of its extreme positions according to the scale which it is required to move, and rotating the knob 24 until the required relation between scale and datum line is obtained; when it is required to move both scales together, simulating movement of the cursor on a conventional slide rule, the lever 23 is set to its intermediate position thus leaving both drive sprockets 6, 6' in engagement with the shaft 8, and then rotating the knob 24.

WHAT I CLAIM IS:—

1. A calculating device comprising at least two parallel logarithmically graduated tapes carried on spools mounted in a housing and movable past a datum line, the tapes being drivable by positive drive members rotatably mounted all on a common drive shaft, drive being transmitted from the drive shaft to the drive members through a clutch mechanism

through which any one or all the drive members may be driven by the drive shaft.

2. A calculating device as claimed in claim 1 in which the clutch mechanism comprises a friction disc fast on the drive shaft and situated between two drive members each associated with a graduated tape, the drive members being urged against the disc by spring pressure, and means by which either drive member may be displaced along the shaft away from the disc.

3. A calculating device as claimed in claim 2, in which the means for displacing the drive members comprises a lever which may be moved between three positions in which it respectively displaces one drive member, displaces neither member and displaces the other member.

4. A calculating device as claimed in claim 3, in which the lever engages the drive members through forks displaceable along a threaded shaft on rotation of the latter by movement of the lever, the forks engaging circumferential grooves in the driving members.

5. A calculating device as claimed in any of the preceding claims, in which each tape has one end attached to a drum on which it may be wound to form a spool, and passes via the drive mechanism to a second drum upon which the other end of the tape is wound to form a second spool, the drums being mechanically connected through a gear train and a preloaded spring whereby a constant tension is applied to the tape by the drums, variations in the diameters of the spools through tape passing from one to the other being compensated for by the consequent change of tension in the spring.

6. A calculating device as claimed in claim 5, in which the spring is a spiral spring housed in one of the drums.

7. A calculating device substantially as described with reference to the accompanying drawings.

For the Applicants,
CARPMAELS & RANSFORD,
Chartered Patent Agents,
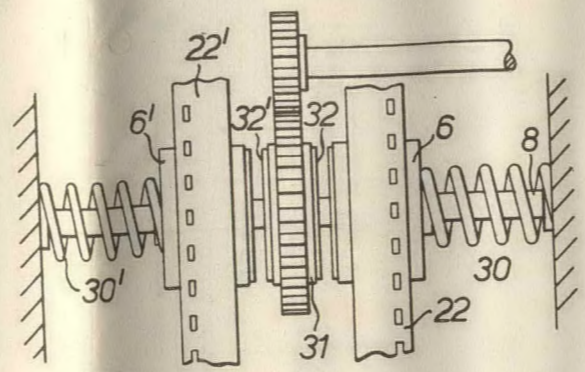24, Southampton Buildings,
Chancery Lane,
London, W.C.2,

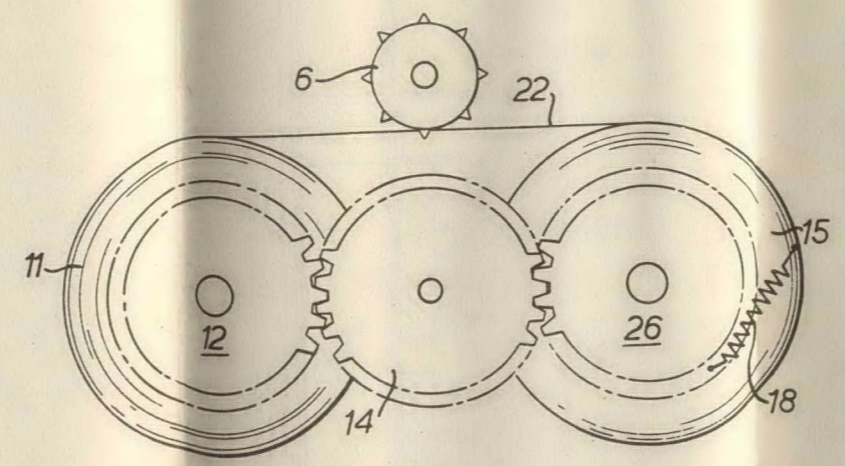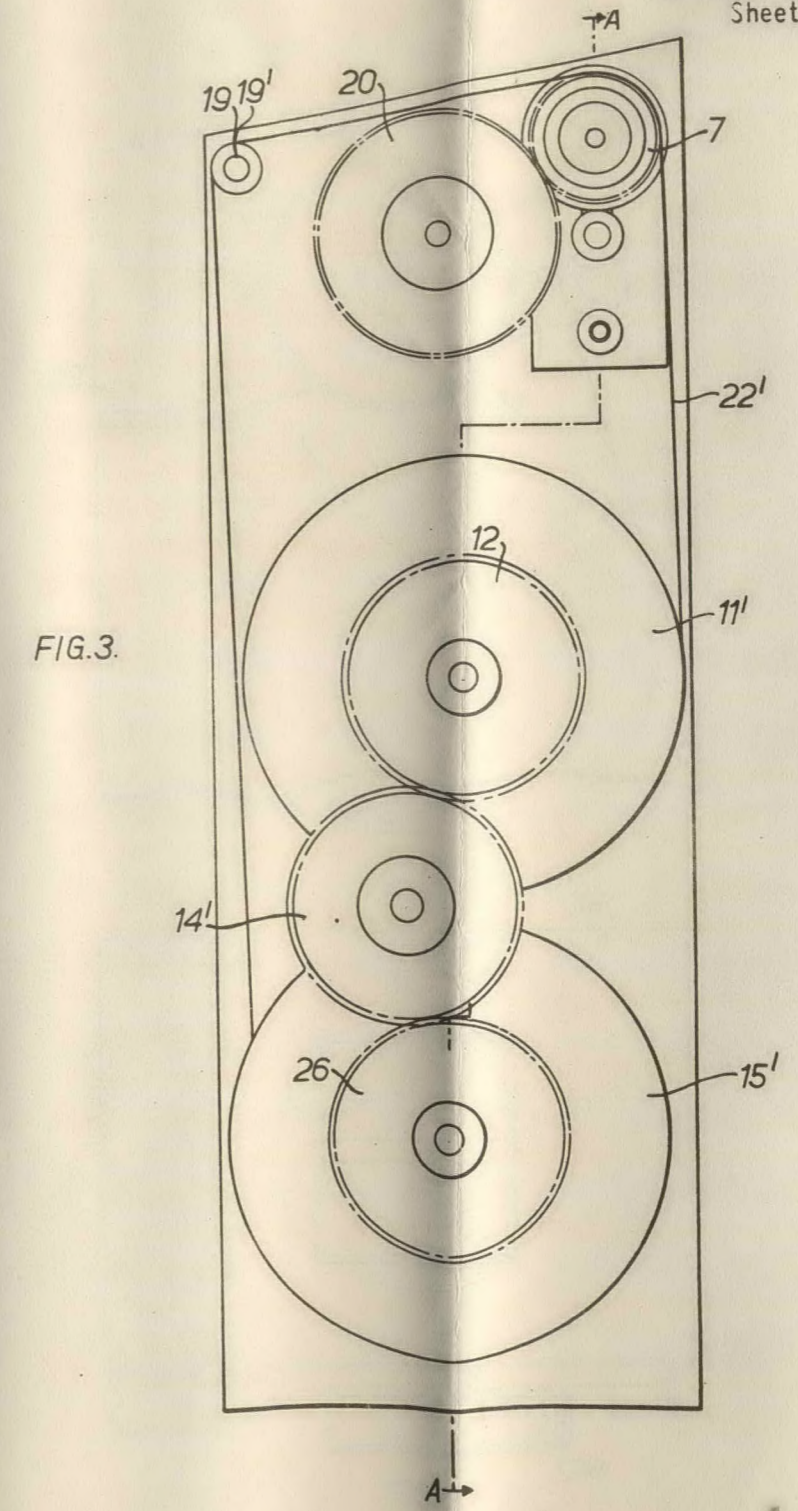1059099   PROVISIONAL SPECIFICATION
4 SHEETS   This drawing is a reproduction of
the Original on a reduced scale
Sheets 1 & 2

FIG.1.

FIG.2.

FIG.3.

1059099   PROVISIONAL SPECIFICATION

4 SHEETS   This drawing is a reproduction of
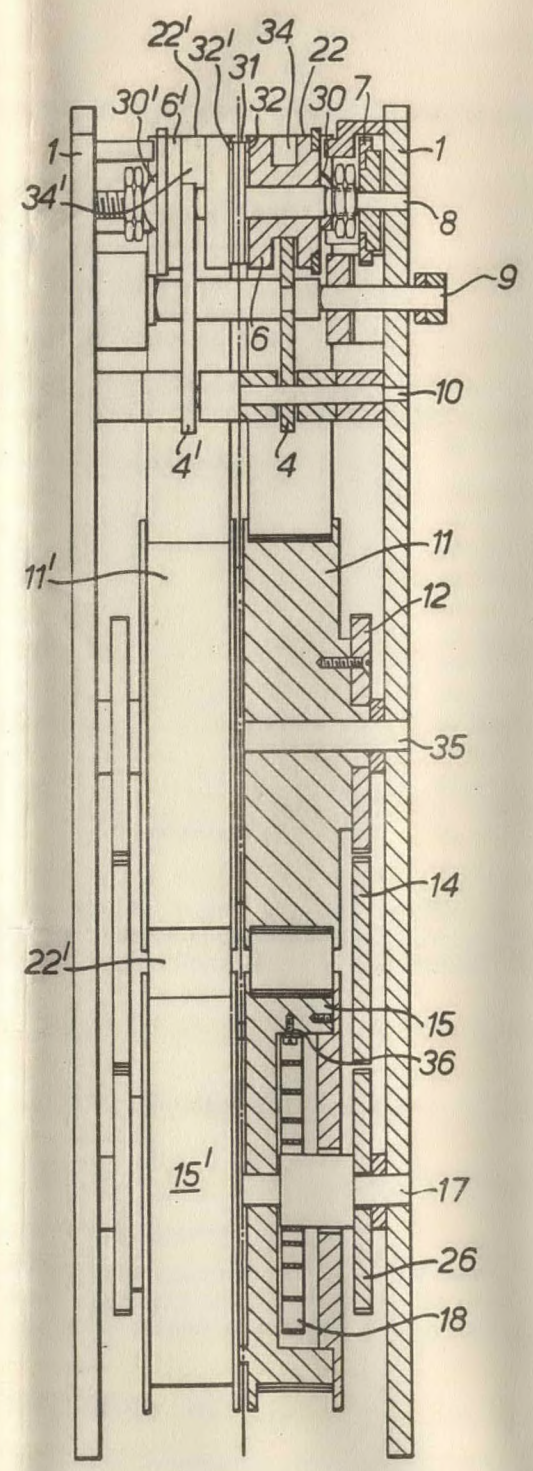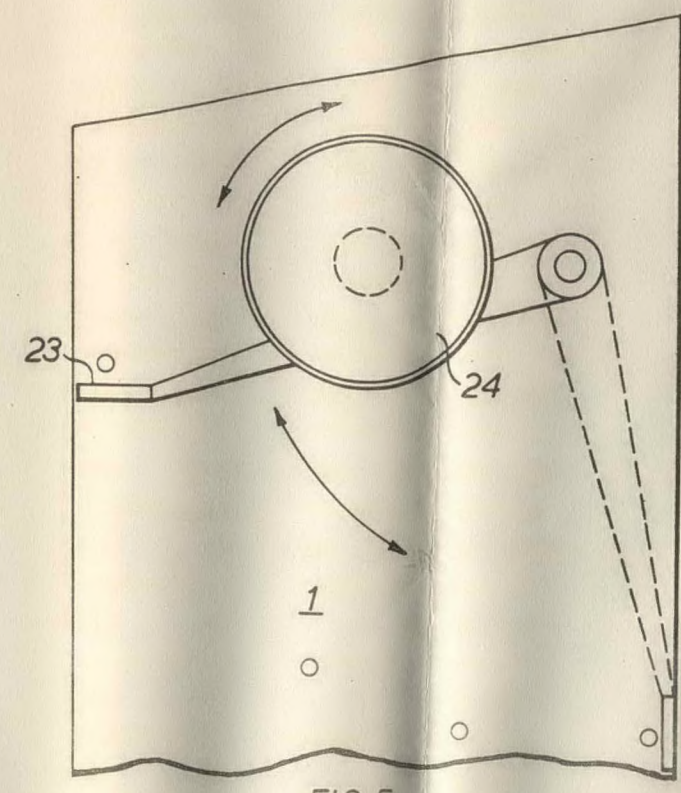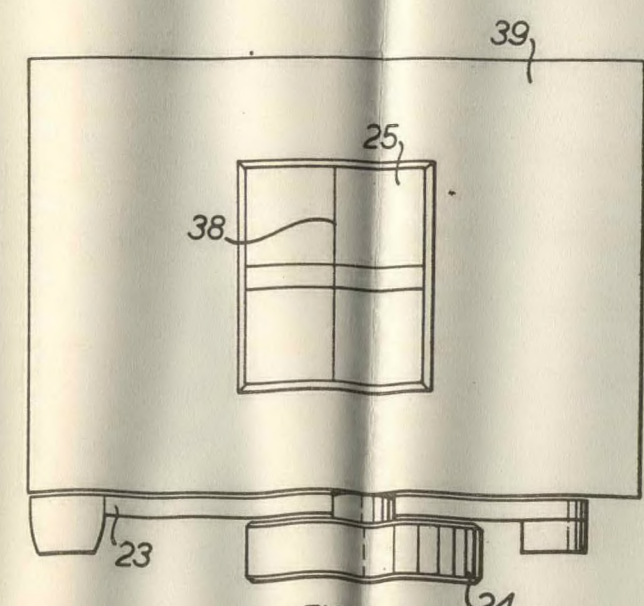the Original on a reduced scale
Sheets 3 & 4

FIG.4.

FIG.5.

FIG.6.

PATENT No.

1059099

The printed specification attached to this document is in the form of the specification at the date of sealing of the patent.

Date of Patent .... **13 September 1965**

Date of Sealing .... **7 JUNE 1967**

(see Sections 33, 37 and 40 of the Patents Act, 1949.)

Note.—The continuance of this Patent is conditional on the payment (by way of Patents Form No. 24) of the prescribed fees, which, under the Patents Rules, 1958, as amended by the Patents (Amendment No. 2) Rules 1964, are :—

												£	s.	d.	
Before the expiration of the 4th year from the date of the Patent (*not from the date of sealing*) and in respect of the 5th year												6	0	0	
,,	,,	,,	5th	,,	,,	,,	,,	,,	,,	,,	6th ,,	7	0	0	
,,	,,	,,	6th	,,	,,	,,	,,	,,	,,	,,	7th ,,	10	0	0	One half only
,,	,,	,,	7th	,,	,,	,,	,,	,,	,,	,,	8th ,,	12	0	0	of these fees
,,	,,	,,	8th	,,	,,	,,	,,	,,	,,	,,	9th ,,	14	0	0	is payable if, and so long as,
,,	,,	,,	9th	,,	,,	,,	,,	,,	,,	,,	10th ,,	17	0	0	this Patent is
,,	,,	,,	10th	,,	,,	,,	,,	,,	,,	,,	11th ,,	20	0	0	endorsed
,,	,,	,,	11th	,,	,,	,,	,,	,,	,,	,,	12th ,,	22	0	0	"Licences of Right "—see
,,	,,	,,	12th	,,	,,	,,	,,	,,	,,	,,	13th ,,	24	0	0	Section 35 of
,,	,,	,,	13th	,,	,,	,,	,,	,,	,,	,,	14th ,,	26	0	0	the Act.
,,	,,	,,	14th	,,	,,	,,	,,	,,	,,	,,	15th ,,	28	0	0	
,,	,,	,,	15th	,,	,,	,,	,,	,,	,,	,,	remainder of the term of the patent	30	0	0	

The Patents Form No. 24, together with the prescribed fee, must be lodged in the Patent Office not later than the due date ; otherwise the patent will cease. If the form with the fee is not lodged in the Patent Office until after that date it cannot be accepted unless application for an extension of time is made on Patents Form No. 25, accompanied by the fee prescribed below. Extension beyond six months cannot be obtained.

For extension of time for payment of a Renewal Fee :

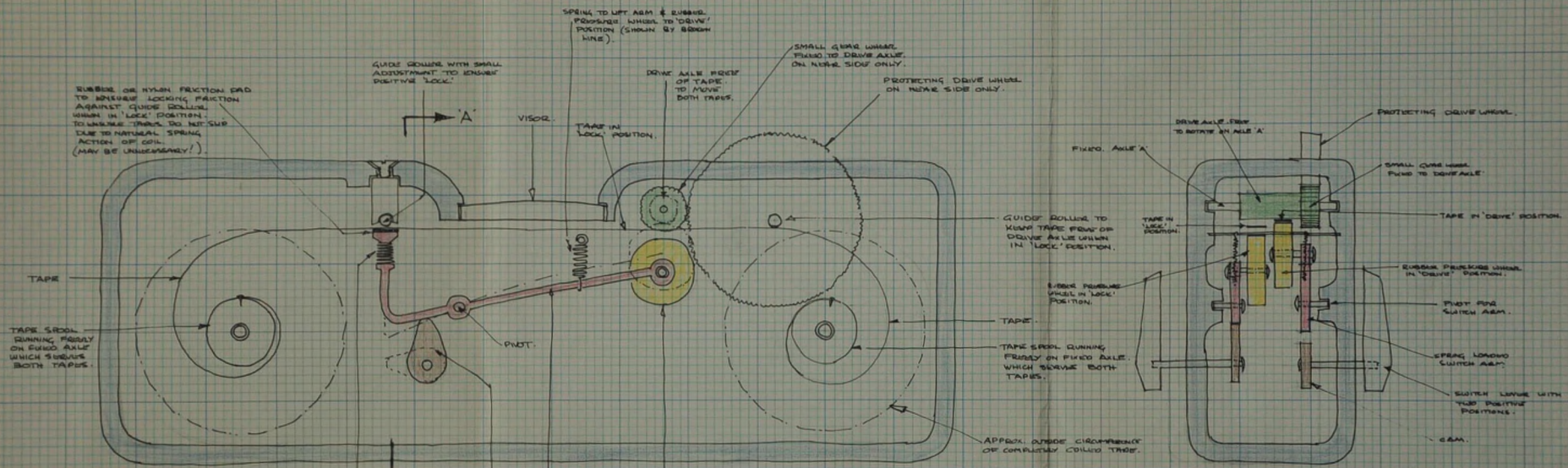|		£	s.	d.				£	s.	d.
Not exceeding 1 month		2	10	0	Not exceeding 4 months			10	0	0
,, ,, 2 months		5	0	0	,, ,, 5 months			12	10	0
,, ,, 3 months		7	10	0	,, ,, 6 months			15	0	0

No reduction of extension fees is made in the case of a Patent endorsed " Licences of Right ".

If any person becomes entitled by assignment, transmission or other operation of law to this patent, or a part interest therein, or to any interest as mortgagee or licensee or otherwise, application must be made to the Comptroller to register such title or interest (see Section 74 of the Act). Particulars as to the manner of making such application may be obtained from the Patent Office.

PROCEDURE FOR PAYMENT OF FEES

Patents fees are payable direct to the Patent Office by means of cash, money order, postal order, banker's draft or cheque. (Adhesive stamps will not be accepted in payment of fees). The prescribed fee must be submitted together with the appropriate completed Patents Form ; in addition each form or batch of forms should be accompanied by a fee sheet (FS. 1) showing details of the form(s) and the amount(s) of the fee(s). Cheques, money orders, etc., should be made payable to " The Comptroller-General, Patent Office ", and crossed. Patents Forms, together with the fees and fee sheets (FS. 1) may be delivered to the Patent Office in London either by hand or by post ; those sent by post should be addressed to " The Cashier, The Patent Office, 25, Southampton Buildings, London, W.C.2 ".

Blank Patents Forms and fee sheets (FS.1) can be obtained from the Clerk of Stationery, Room 156, The Patent Office, 25, Southampton Buildings, London, W.C.2.

A

SPRING TO LIFT ARM & RUBBER PRESSURE WHEEL TO 'DRIVE' POSITION (SHOWN BY BROKEN LINE).

SMALL GEAR WHEEL FIXED TO DRIVE AXLE ON NEAR SIDE ONLY.

GUIDE ROLLER WITH SMALL ADJUSTMENT TO ENSURE POSITIVE 'LOCK'.

DRIVE AXLE FREE OF TAPE, TO MOVE BOTH TAPES.

PROTECTING DRIVE WHEEL ON NEAR SIDE ONLY.

RUBBER OR NYLON FRICTION PAD TO ENSURE LOCKING FRICTION AGAINST GUIDE ROLLER WHICH IN 'LOCK' POSITION. TO ENSURE TAPES DO NOT SLIP DUE TO NATURAL SPRING ACTION OF COIL. (MAY BE UNNECESSARY!)

'A'

VISOR.

TAPE IN 'LOCK' POSITION.

PROTECTING DRIVE WHEEL.

DRIVE AXLE FREE TO ROTATE ON AXLE 'A'.

FIXED AXLE 'A'.

SMALL GEAR WHEEL FIXED TO DRIVE AXLE.

TAPE.

TAPE IN 'LOCK' POSITION.

GUIDE ROLLER TO KEEP TAPE FREE OF DRIVE AXLE (SHOWN IN 'LOCK' POSITION.

TAPE IN 'DRIVE' POSITION.

RUBBER PRESSURE WHEEL IN 'LOCK' POSITION.

RUBBER PRESSURE WHEEL IN 'DRIVE' POSITION.

TAPE SPOOL RUNNING FREELY ON FIXED AXLE WHICH SERVES BOTH TAPES.

PIVOT.

TAPE.

TAPE SPOOL RUNNING FREELY ON FIXED AXLE WHICH SERVES BOTH TAPES.

PIVOT FOR SWITCH ARM.

SPRING LOADED SWITCH ARM.

SWITCH LEVER WITH TWO POSITIVE POSITIONS.

CAM.

APPROX. OUTSIDE CIRCUMFERENCE OF COMPLETELY COILED TAPE.

SPRING WITH SMALL POSSIBLE EXTENSION TO DELAY UNLOCKING OF TAPE UNTIL PRESSURE WHEEL AND DRIVE AXLE HAVE TAKEN OVER LOCKING OF TAPE.

SPRING LOADED SWITCH ARM. 'LOCK' POSITION AS ABOVE 'DRIVE' POSITION AS PER BROKEN LINE.

RUBBER PRESSURE WHEEL RUNNING FREELY ON AXLE FIXED TO SWITCH ARM (FREE OF TAPE IN THIS I.E. 'LOCK' POSITION.)

SIDE ELEVATION

SECTION 'A-A'.

ECCENTRIC CAM FIXED TO SWITCH LEVER ON OUTSIDE OF CASING. SWITCH TO HAVE TWO POSITIVE POSITIONS —
'LOCK' (AS ABOVE)
'DRIVE' (SHOWN BY BROKEN LINE.)

THE WIND RULE.
ROUGH DIAGRAMMATIC DRAWING.
SCALE: TWICE FULL SIZE.

L. Rambau
15·5·1963

NO FEE

PATENTS ACT, 1949

Declaration as to inventorship (Section 4 (5))

(a) Insert name(s) of applicant(s).

I/We (a) LIONEL BERNSTEIN,

do hereby declare that the true and first inventor.......... of the invention disclosed in the complete specification filed in pursuance of my/our application........ numbered 24513/64 and dated the twelfth day of June 19 64 is/are

(b) State name, address and nationality of inventor or of each inventor.

(b) John Charles Williams, a British subject of Milestone House, London Road, Blackwater, Camberley, and Lionel Bernstein a citizen of of the Republic of South Africa, of 154 Regent Street, Observatory, Transvaal Province, Republic of S. Africa. and that my/our right to apply for a patent for the invention is as follows

(c) This need not be filled in if the inventor(s) named at (b) is or are an applicant or applicants, or if the right to apply is as stated on the application form.

(c) ....

(d) To be signed by applicant(s).

*(d)

Except in the case of a Convention Application, if any person named as inventor at (b) above is not so named in the application or in any of the applications, he must sign the following statement.

I assent to the invention referred to in the above declaration, being included in the complete specification filed in pursuance of the stated application(s).

To the Comptroller,
The Patent Office, 25 Southampton Buildings,
Chancery Lane, London W.C.2.

Name of Agents (if any)

CARPMAELS & RANSFORD

*Where any signatory to this Form is signing on behalf of a body corporate, the capacity in which he signs should be stated (in English) after his signature.

24 SOUTHAMPTON BUILDINGS,
CHANCERY LANE,
LONDON, W.C.2.

Application No.   24513/64

Date   12th June 1964.

Title   "Improvements in Calculating Devices".

Name   Lionel Bernstein.

CARPMAELS & RANSFORD,
Chartered Patent Agents.

PATENTS ACTS 1949 - 1961

PROVISIONAL SPECIFICATION

"Improvements in Calculating Devices."

I, LIONEL BERNSTEIN, a citizen of the Republic of South
Africa, of 154 Regent Street, Observatory, Transvaal Province,
Republic of South Africa, do hereby declare this invention to
be described in the following statement:

This invention relates to calculating devices and more particularly to devices using a slide rule principle.

The accuracy of a slide rule having the normal subdivisional logarithmic scale markings decreasing along the length of the scales on the rule is dependent to a large extent upon the length of the rule, which is limited by practical considerations. Cylindrical rules have been made to increase the scale lengths but in general these rules are cumbersome and often difficult to manipulate.

It is the object of the present invention to provide a slide rule type calculator which may be made with elongated scales while the overall size of the calculator is kept to a minimum.

Calculating devices have been proposed which comprise a pair of tapes graduated to form the scales of a slide rule, the tapes being carried on spools mounted in a housing and positioned parallel to each other, means being provided for moving both tapes independently of each other or in unison in either longitudinal direction past a datum line.

This principle does not appear to have been widely adopted, and it would seem that the principal objections are the **difficulty** of providing a convenient operating mechanism to drive the tapes, and of maintaining a constant tension in said tapes. A further object of the invention is to overcome these difficulties.

According to the invention in a calculating device of the type described, the tapes are driven by sprockets or like positive drive members rotatably mounted upon a common drive shaft, drive being transmitted from the drive shaft to the drive members through a clutch mechanism by which either or both

- 2 -

drive members may be locked to the drive shaft.

Preferably the clutch mechanism comprises a friction disc fast on the drive shaft and situated between the drive members, the latter being urged against the disc by spring pressure, means being provided by which either drive member may be displaced along the shaft away from the disc.

According to a further feature of the invention one end of each tape is attached to a drum to form a spool the radius of which is such that it is not substantially increased when the tape is wound upon it, and passes through the drive mechanism to a second drum upon which the other end of the tape is wound, the drums being mechanically connected through a gear train and a preloaded spiral spring whereby a constant tension is applied to the tape by the drums, variations in the diameters of the drum through the tape passing from one to the other being compensated by the consequent change of tension in the spring.

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

Fig. 1 is a diagrammatic illustration of the operation of the drive mechanism.

Fig. 2 is a diagrammatic illustration of the operation of tensioning mechanism.

Fig. 3 is a side elevation of the calculator with one side plate removed for clarity.

Fig. 4 is a plan view of the calculator showing a part section along the line AA (Fig. 3).

Fig. 5 is a part side elevation of the calculator.

Fig. 6 is an end elevation.

Referring to Fig. 1, two perforated tapes 22, 22' having

slide rule scales pass over sprockets 6, 6' mounted for free
rotation upon a shaft 8. The sprockets 6 6' are urged by
springs 30, 30' against a disc 31 fast on the shaft 8 and
provided with facings 32 32' of friction material.   The lever

5   23 (Fig.5) may be moved to any of three alternative positions,
in one ⋅position disengaging the sprocket 6 from the disc 31
against the pressure of the spring 30, at another position
disengaging the sprocket 6' from the disc against the pressure
of the spring 30', and at an intermediate position allowing

10 both sprockets to remain in contact with the disc.

In figure 2 the tape 22 is shown spooled onto the drums
11 and 15, the tape being driven by the sprocket 6. The drum
11 is fast to a rotatably mounted gear wheel 12, whilst the
drum 15 is connected to a gear 26 through a spiral spring

15 diagrammatically indicated at 18. The two gears mesh with a
common idler gear 14, rotation of gear 12 thus producing a
corresponding rotation of gear 26. The spring 18, which is
pretensioned, acts on the drum 15 to create a suitable tension
in the tape 22. As the tape passes from one spool to the

20 other, the first spool will become smaller in diameter whilst
the second spool increases in diameter causing, as a result
of the gear train 12, 14, 26 the gear 26 to move relative to
the drum 15 thus altering the tension in the spring 18 and
compensating for the alteration in the tape tension which would

25 otherwise occur as a result of the change in diameter of the
spool on drum 15.

An embodiment of the calculator of the invention is
illustrated in figs. 3 - 6. The mechanism is contained within
two elongated side plates 1 between which extend the various

30 shafts carrying the moving parts of the mechanism. The tapes

- 4 -

22, 22' are wound at one end on the spools 15, 15' from which
they pass over the idlers 19, 19' the drive sprockets 6 6'
and back to the spools 11, 11' onto which the other ends of the
tapes are wound.

5   The drive sprockets 6 6' are journalled for free rotation
on the shaft 8 a disc 31 carrying facings 32, 32' of friction
material being fast to the shaft 8 between the sprocket 6
and sprocket 6' springs 30 30' urging the sprockets against
the facings.   At one end of the shaft 8 is a gear 7 fast to

10   the shaft and meshing with a gear 20 driven by a knob 24 on
the exterior of the machine.   A shaft 9 carries forks 4, 4'
on a multistart thread, so that rotation of the shaft causes
lateral displacement of the forks which are restrained against
rotation by the crossbar 10.   The open ends of the forks

15   engage circumferential grooves 34, 34' in the sprockets 6, 6'
the grooves being somewhat wider than the forks, which are
positioned so that they normally lie close to the outer sides
of the grooves.   Rotation of the shaft 9 by means of the
external lever 23 in one direction will thus cause the fork 4

20   to bear against the outer side of the groove 34 and force the
sprocket 6 away from thefacing 32 against the pressure of the
spring 30, whilst the fork 4' moves towards the inner side of
the groove 34' without exerting pressure on the sprocket 6'.
Disengagement of the sprocket 6' from the facing 32' is

25   achieved by rotating the shaft 9 in the opposite direction.
        Since the tensioning mechanism for each of the two
tapes is identical, only that for tape 22 is described.   A
drum 11 carries wound about it a portion of the tape 22 to form
a spool, the tape passing through the drive mechanism and

30   back to the spool formed by the remainder of the tape wound on

- 5 -

drum 15 the two drums being journalled for rotation on
shafts 35 and 17 respectively.   Drum 15 is formed with a
cylindrical recess 36 to the circumferential surface of which
is attached to one end of a spiral spring 18, the other end
5   of which is attached to a spindle 17.   Fast to drum 11
and to spindle 17 are gears 12 and 26, both of which mesh
with an idler 14.   The arrangement functions as described
with reference to figure 2.

Between the idlers 19, 19' and the drive sprockets 6, 6'
10   the tapes pass beneath a window 25 provided with a datum line
38 in an end plate 39 fixed to the side plates 1, 1'.

The operation of the calculator is similar to that of
an ordinary slide rule, except that instead of having a moving
scale, a stationary scale, and a moving cursor, both scales
15   are movable, and instead of the cursor a static datum line is
provided.   The scales may be set individually by turning the
lever 23 to either of its extreme positions according to the
scale which it is required to move, and rotating the knob 24
until the required relation between scale and datum line is
20   obtained; when it is required to move both scales together,
simulating movement of the cursor on a conventional slide
rule, the lever 23 is set to its intermediate position thus
leaving both drive sprockets 6, 6' in engagement with the
shaft 8, and then rotating the knob 24.

For the Applicants,

CARPMAELS & RANSFORD.
Chartered Patent Agents,
24, Southampton Buildings,
Chancery Lane,
London, W.C.2

Our Ref. RDS/GL

14th September, 1965.

L. Bernstein Esq.,
43 Frognal,
London, N.W.3.

Dear Sir,

Re: British Patent Application No. 24513/64
"Improvements in Calculating Devices".

    The Complete Specification in this case has now been filed at the Patent Office and we have pleasure in sending you herewith 2 copies of the specification together with our Debit Note.

Yours truly,
CARPMAELS & RANSFORD.

PATENTS ACTS 1949 -1961

COMPLETE SPECIFICATION

"Improvements in Calculating Devices"

I, LIONEL BERNSTEIN, a citizen of the Republic of
South Africa, of 154 Regent Street, Observatory, Transvaal
Province, Republic of South Africa, do hereby declare the
invention, for which I pray that a patent may be granted to me,
and the method by which it is to be performed, to be particularly
described in and by the following statement:-

- 1 -

This invention relates to calculating devices and
more particularly to devices using a slide rule principle.

The accuracy of a slide rule having the normal sub-
divisional logarithmic scale marking decreasing along the
5   length of the scales on the rule is dependent to a large
extent upon the length of the rule, which is limited by
practical considerations. Cylindrical rules have been
made to increase the scale lengths but in general these
rules are cumbersome and often difficult to manipulate.

10   It is the object of the present invention to provide
a slide rule type calculator which may be made with
elongated scales while the overall size of the calculator
is kept to a minimum.

Calculating devices have been proposed which comprise
15   a pair of tapes graduated to form the scales of a slide rule,
the tapes being carried on spools mounted in a housing and
positioned parallel to each other, means being provided for
moving both tapes independently of each other or in unison
in either longitudinal direction past a datum line.

20   This principle does not appear to have been widely
adopted, and it would seem that the principal objections
are the difficulty of providing a convenient operating
mechanism to drive the tapes, and of maintaining a constant
tension in said tapes. A further object of the invention is
25   to overcome these difficulties.

According to the invention in a calculating device of
the type described, the tapes are driven by sprockets or like
positive drive members rotatably mounted upon a common drive
shaft, drive being transmitted from the drive shaft to the
30   drive members through a clutch mechanism by which either or

both drive members may be locked to the drive shaft.

Preferably the clutch mechanism comprises a friction disc fast on the drive shaft and situated between two drive members, the latter being urged against the disc by spring pressure, means being provided by which either drive member may be displaced along the shaft away from the disc.

According to a further feature of the invention each tape has one end attached to a drum to form a spool the radius of which is such that it is not substantially increased when the tape is wound upon it, and passes through the drive mechanism to a second drum upon which the other end of the tape is wound to form a second spool, the drums being mechanically connected through a gear train and a preloaded spring whereby a constant tension is applied to the tape by the drums, variations in the diameters of the drum through the tape passing from one to the other being compensated by the consequent change of tension in the spring.

The invention is described with reference to the drawings accompanying/drawings the provisional specification in which:

Fig. 1 is a diagrammatic illustration of the operation of the drive mechanism.

Fig. 2 is a diagrammatic illustration of the operation of tensioning mechanism.

Fig. 3 is a side elevation of the calculator with one side plate removed for clarity.

Fig. 4 is a plan view of the calculator showing a part section along the line AA (Fig. 3).

Fig. 5 is a part side elevation of the calculator.

Fig. 6 is an end elevation.

Referring to Fig. 1, two perforated tapes 22, 22'
having slide rule scales pass over sprockets 6, 6' mounted
for free rotation upon a shaft 8. The sprockets 6 6' are
urged by springs 30, 30' against a disc 31 fast on the
5   shaft 8 and provided with facings 32 32' of friction
material. A lever 23 (Fig. 5) may be moved to any of three
alternative positions, in one position disengaging the
sprocket 6 from the disc 31 against the pressure of the
spring 30, at another position disengaging the sprocket 6'
10   from the disc against the pressure of the spring 30', and
at an intermediate position allowing both sprockets to
remain in contact with the disc.

In figure 2 the tape 22 is shown spooled onto the
drums 11 and 15, the tape being driven by the sprocket 6.
15   The drum 11 is fast to a rotatably mounted gear wheel 12,
whilst the drum 15 is connected to a gear 26 through a
spiral spring diagrammatically indicated at 18. The two
gears mesh with a common idler gear 14, rotation of gear 12
thus producing a corresponding rotation of gear 26. The
20   spring 18, whichis pretensioned, acts on the drum 15 to
create a suitable tension in the tape 22. As the tape
passes from one spool to the other, the first spool will
become smaller in diameter whilst the second spool increases
in diameter causing, as a result of the gear train 12, 14,
25   26 the gear 26 to move relative to the drum 15 thus altering
the tension in the spring 18 and compensating for the
alteration in the tape tension which would otherwise occur
as a result of the change in diameter of the spool on drum 15.

An embodiment of the calculator of the invention is
30   illustrated in figs. 3 - 6. The mechanism is contained within

- 4 -

two elongated side plates 1 between which extend the various
shafts carrying the moving parts of the mechanism.   The
tapes 22, 22' are wound at one end on the spools 15, 15'
from which they pass over the idlers 19, 19' the drive
sprockets 6 6' and back to the spools 11, 11! onto which the
other ends of the tapes are wound.

      The drive sprockets 6 6' are journalled for free
rotation on the shaft 8, a disc 31 carrying facings 32, 32'
of friction material being fast to the shaft 8 between the
sprocket 6 and sprocket 6', springs 30 30' urging the
sprockets against the facings.   At one end of the shaft 8
is a gear 7 fast to the shaft and meshing with a gear 20
driven by a knob 24 on the exterior of the machine.   A shaft
9 carries forks 4, 4' on a multistart thread, so that
rotation of the shaft causes lateral displacement of the
forks which are restrained against rotation by a crossbar 10.
The open ends of the forks engage circumferential grooves
34, 34' in the sprockets 6, 6' the grooves being somewhat
wider than the forks, which are positioned so that they
normally lie close to the outer sides of the grooves.
Rotation of the shaft 9 by means of the external lever 23
in one direction will thus cause the fork 4 to bear against
the outer side of the groove 34 and force the sprocket 6
away from the facing 32 against the pressure of the spring
30, whilst the fork 4' moves towards the inner side of the
groove 34' without exerting pressure on the sprocket 6'.
Disengagement of the sprocket 6' from the facing 32' is
achieved by rotating the shaft 9 in the opposite direction.

      Since the tensioning mechanism for each of the two
tapes is identical, only that for tape 22 is described.   A

drum 11 carries wound about it a portion of the tape 22
to form a spool, the tape passing through the drive
mechanism and back to the spool formed by the remainder
.of the tape wound on a drum 15 the two drums being
journalled for rotation on shafts 35 and 17 respectively.
The drum 15 is formed with a cylindrical recess 36 to the
circumferential surface of which is attached to one end
of a spiral spring 18, the other end of which is attached
to a spindle 17. Fast to the drum 11 and to the spindle
17 are gears 12 and 26, both of which mesh with an idler
14. The arrangement functions as described with reference
to figure 2.

Between the idlers 19, 19' and the drive sprockets
6, 6' the tapes pass beneath a window 25, provided with a
datum line 38, in an end plate 39 fixed to the side plates
1, 1'.

The operation of the calculator is similar to that
of an ordinary slide rule, except that instead of having a
moving scale, a stationary scale, and a moving cursor, both
scales are movable, and instead of the cursor a static datum
line is provided. The scales may be set individually by
turning the lever 23 to either of its extreme positions
according to the scale which it is required to move, and
rotating the knob 24 until the required relation between
scale and datum line is obtained; when it is required to
move both scales together, simulating movement of the cursor
on a conventional slide rule, the lever 23 is set to its
intermediate position thus leaving both drive sprockets 6,
6' in engagement with the shaft 8, and then rotating the
knob 24.

- 6 -

What I claim is:-

1.   A calculating device of the slide rule type comprising
at least two parallel graduated tapes carried on spools
mounted in a housing movable past a datum line, the tapes being
driven by sprockets or like positive drive members rotatably
mounted on a common drive shaft, drive being transmitted from
the drive shaft to the drive members through a clutch
mechanism by which either or both drive members may be locked
to the drive shaft.

2.   A calculating device as claimed in claim 1 in which
the clutch mechanism comprises a friction disc fast on the
drive shaft and situated between two drive members, the
latter being urged against the disc by spring pressure, and
means by which either drive member may be displaced along the
shaft away from the disc.

3.   A calculating device as claimed in claim 2, in which
the means for displacing the drive members comprises a
lever which may be moved between three positions in which it
respectively displaces one drive member, displaces neither
member and displaces the other member.

4.   A calculating device as claimed in claim 3, in which
the lever engages the drive members through forks displace-
able along a threaded shaft on rotation of the latter by
movement of the lever, the forks engaging circumferential
grooves in the driving members.

5.   A calculating device as claimed in any of the preceding
claims, in which each tape has one end attached to a drum to
form a spool the radius of which is sufficiently large that
it is not substantially increased when the tape is wound upon
it, and passes through the drive mechanism to a second drum

upon which the other end of the tape is wound to form a second spool, the drums being mechanically connected through a gear train and a preloaded spring whereby a constant tension is applied to the tape by the drums,

5 variations in the diameters of the spools through tape passing from one to the other being compensated for by the consequent change of tension in the spring.

6.   A calculating device as claimed in claim 5, in which the spring is a spiral spring housed in one of the

10 drums.

7.   A calculating device substantially as described with reference to the accompanying drawings.

For the Applicant,

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24, Southampton Buildings,
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MHC/RARP/JC

COMP SPECN
No 24513/64
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PATENTS ACTS 1949 -1961

COMPLETE SPECIFICATION

"Improvements in Calculating Devices"

I, LIONEL BERNSTEIN, a citizen of the Republic of
South Africa, of 154 Regent Street, Observatory, Transvaal
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invention, for which I pray that a patent may be granted to me,
and the method by which it is to be performed, to be particularly
described in and by the following statement:-

- 1 -