Aug. 28, 1951 S. LIDZ 2,565,661

RADIO ANTENNA SYSTEM

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Fig. 1

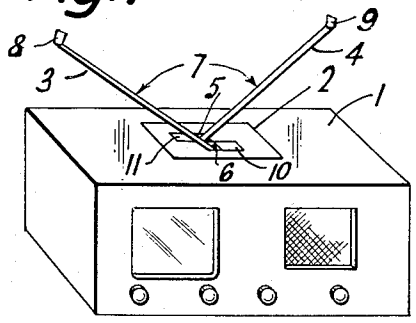


Fig. 4

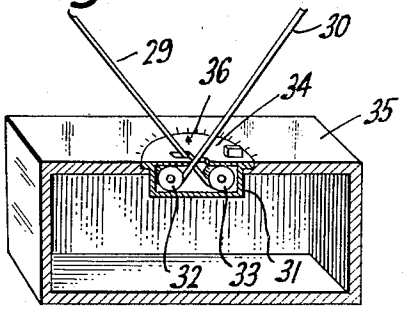


Fig. 2

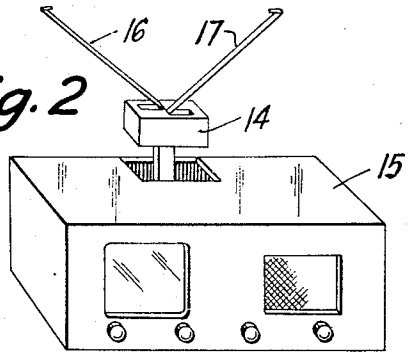


Fig. 5

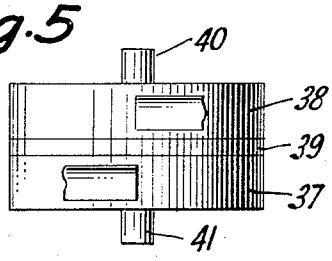


Fig. 6

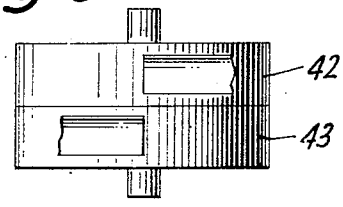


Fig. 3a

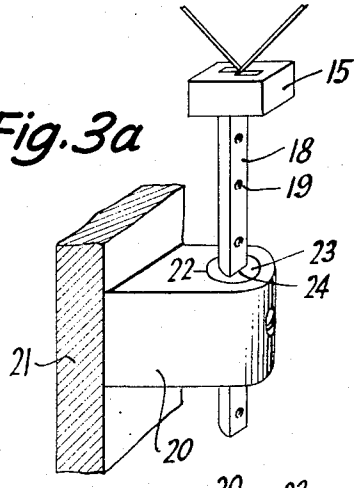


Fig. 7

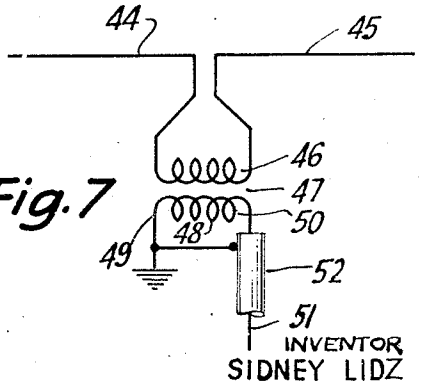
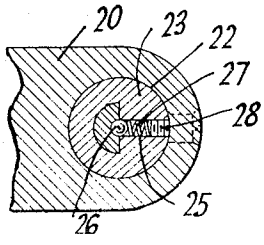


Fig. 3b



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Fig. 8

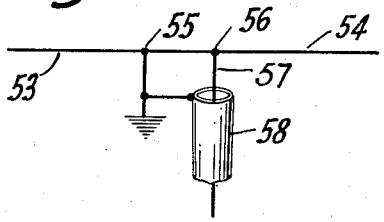


Fig. 11

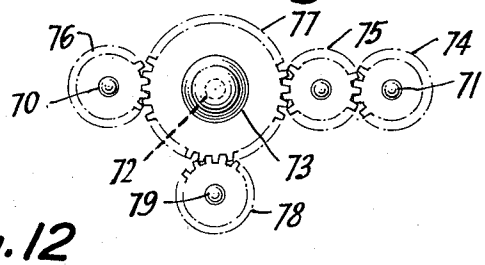


Fig. 9a

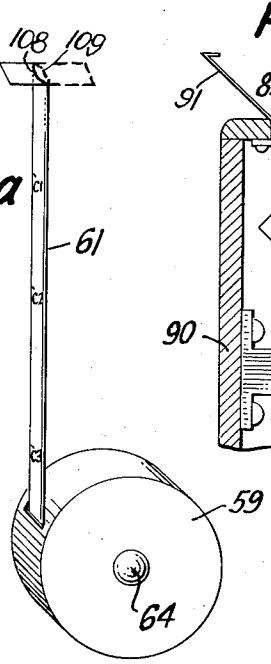


Fig. 12

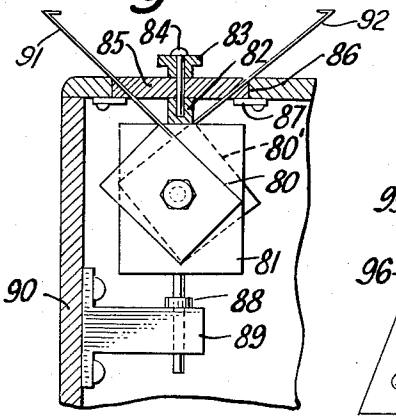


Fig. 13

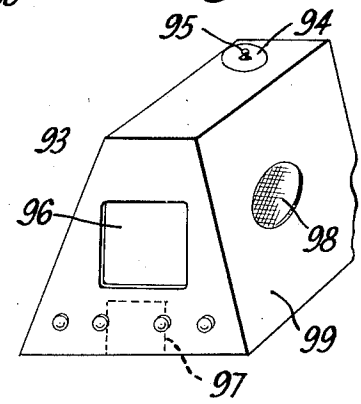


Fig. 14

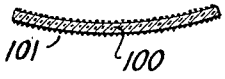


Fig. 9b

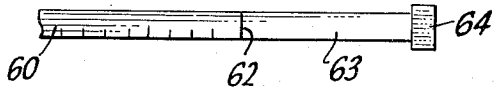


Fig. 15

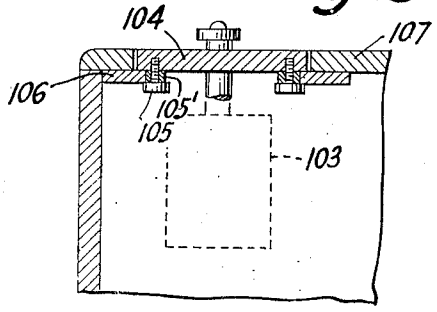
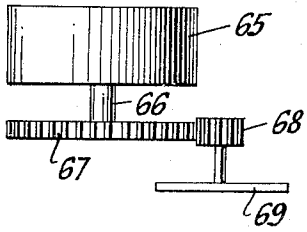


Fig. 10



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UNITED STATES PATENT OFFICE

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RADIO ANTENNA SYSTEM

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Application March 14, 1949, Serial No. 81,243

4 Claims. (Cl. 250—33)

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This invention relates to radio antennas for portable and home receivers, and more specifically, to television antennas, especially those of the dipole type.

The antennas now existing on the market, for instance, those of the telescopic type, are expensive and cumbersome. They impede portability and are not as easily operative as desirable.

One of the objects of this invention is an antenna or antenna system which in its operative condition takes a minimum of space, and which can be easily made operative with a high degree of adjustability to different conditions. The novel antenna system is also electrically extremely effective, while relatively inexpensive in manufacture and assembly.

Another object of the invention is an antenna system which may be adapted to any type of receiver with a minimum of changes or inconvenience, if any, to either antenna or receiver, and which also may have any desired number of elements, dependent upon the requirements of the receiver.

A further object of the invention is a home and portable receiver including such antenna or antenna system, and which in its operative state, has no protruding or projecting parts, all the antenna members being hidden in the receiver housing, yet consuming therein a minimum of space and being ready at any time for operation.

Still another object of the invention is a home or portable receiver in which the antenna or antenna system in its operating position may be readily adjustable to any desired angle or wave length of reception, while not impeding a rapid assembly or disassembly.

An additional object of the invention is a home or portable receiver wherein the antenna or antenna system, in spite of its facility in assembly or disassembly, permits ready coupling with other elements of the receiver, such as the tuning unit. Thus length and/or angle or position of the antenna may be varied simultaneously from a distance, and preferably synchronously, with the operation of the tuning unit.

More specifically, the invention provides an antenna or antenna system in the form of an elastic flexible tape or tapes, such as are used as measuring tapes, which, in their non-operative state, form a coil of the spiral type, and in their operative state, form longitudinal conductors capable of more or less freely expanding into space.

Another specific object of the invention is to support at least two such elastic flexible tapes

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adjacently, as a single unit, which in its inoperative condition, is preferably completely hidden just below the type of the receiver cabinet or housing, and which in its operative condition, permits the extension into space of the tapes into a position projecting from the receiver; in this position, and in the case of two tapes, these tapes are arranged to form an upwardly open angle which has its apex at or near the top, above or within the cabinet.

A further specific object of the invention is to increase the self-supporting properties of the tape or tapes in their operative condition, without reducing their power to recoil by themselves, by dimensioning a cross-section of such tape with a certain width and curvature which cooperates with a desired length or lengths and the inherent strength and elasticity, so as to permit self-support in space for a sufficient maximum length of say, 40 inches.

Still another object of the invention is the selection of the proper material for the tape, which may be made of steel or plastic, just as a measuring tape is made of such material, and may be made conductive by spraying or plating, or may be entirely made of suitable elastic flexible and conductive material such as Phosphor bronze.

However, the invention is not limited to any type of material or dimension, because all these factors are believed to be within the expert knowledge of the engineer, once the principles set forth in this invention are properly understood and practically applied.

These and other objects of the invention will be more fully understood from the accompanying drawings, a description of which now follows.

Fig. 1 shows schematically a television receiver incorporating an antenna system of the dipole type, in accordance with the invention.

Fig. 2 shows similarly schematically the antenna unit in Fig. 1 forming an independent part of the receiver which may be raised or lowered over and below the top of the cabinet, as desired, to permit its placement into operative or non-operative position respectively, and simultaneously also, to facilitate angle adjustments when in operative position.

Figs. 3A, 3B show side and top views respectively, the latter in section, of a lifting mechanism such as shown in Fig. 2.

Fig. 4 shows a cross-section through the receiver and the antenna unit. The arrangement of the unit represents a modification of Fig. 2 and permits angle adjustment of the antenna

system without the necessity of raising and lowering the unit.

Fig. 4 also illustrates an example of a relative arrangement of two coils in which the antenna tapes are wound back when transport or inactivity is desired.

Fig. 5 shows an alternative relative arrangement of a pair of coils.

Fig. 6 represents a modification of Fig. 4.

Fig. 7 illustrates a circuit diagram for connecting an antenna system according to the invention, with the receiver proper.

Fig. 8 represents an alternative circuit diagram.

Fig. 9A and Fig. 9B show respectively a single coil antenna and its attachment to a coil housing or a shaft supported therein.

Fig. 10 illustrates a coil having an inner coil shaft coupled to a knob. This permits adjustment of the length of the antenna from the outside or any other point of the receiver, corresponding to different wave lengths or channels associated with the different antenna lengths.

Fig. 11 illustrates the gear mechanism coupling the shaft of an antenna coil to the shaft of a tuning unit of the continuous tuning type, to permit simultaneously with the tuning operation, the adjustment of the coil antenna for an appropriate wave length.

Fig. 12 indicates a coil assembly mounted for rotation inside the cabinet, but operative from the outside thereof.

Fig. 13 shows a portable television receiver with a coil assembly mounted thereon in a predetermined position of the cabinet.

Fig. 14 gives a cross-section through an antenna tape having a plastic core spread with a conductive powder.

Fig. 15 illustrates a modification of Fig. 12. There is a coil housing supported on the top surface of the receiver slightly below thereof, and operative from above.

In Fig. 1, 1 represents a receiver cabinet, 2 is a coil unit arranged flush with the top of the cabinet 1, and supported within cabinet 1 with tapes 3 and 4 extending therefrom through slots 5 and 6. Slots 5 and 6 must be large enough to permit, in addition, tapes 3 and 4 to support themselves freely at different lengths, which in turn causes the occurrence of different opening angles 7. Although it is desirable and under certain conditions preferable that the antennas should extend freely into space, it is not indispensable for the purpose of the invention. It is possible to arrange support points at various lengths of the antenna tapes when extended, without departing from the spirit of this invention.

In non-operating condition, only the bent-out end portions 8, 9 of antenna tapes 3, 4 are visible from the top of cabinet 1. Slots 5, 6 may be covered by sliding plates 10, 11. This is to prevent dust from collecting into the cabinet without impeding mobility of the antenna tapes 3, 4 to assume any desired length or opening angle.

Tapes 3, 4 are ordinary steel tapes of about 5/8'' width, of the type used in measuring tapes. Such tapes may also be used with their customary housings, also made of steel or plastic, if necessary, which are not shown in Fig. 1.

Tapes 3, 4 are made conductive by an appropriate metal spray or plating well-known in the art, and therefore neither illustrated nor described in the drawings.

Fig. 2 represents an elaboration or modification of Fig. 1, in that a coil unit 14 is arranged to be lifted out of cabinet 15, to permit the tapes

16, 17 to be adjusted to any desired direction, in accordance with the angle of reception provided for a particular station or channel.

Such a lifting mechanism is schematically illustrated in Figs. 3A and 3B in elevation and section respectively. There the unit 15 is supported on a D-shaped shaft 18, provided along its flat portion with a series of semi-globular recesses 19. A bracket 20 attached to a vertical wall 21 of the receiver is provided with an opening 22 for receiving a flanged sleeve 23 rotatably fitting therein. Sleeve 23 has a central opening 24 adapted to receive D-shaft 18. Sleeve 23 is also provided with a cross-opening 25 adapted to receive in the order mentioned steel ball 26, coil spring 27 and closing screw 28. In this way, ball 26 may be held by the spring pressed against the flat portion of D-shaft 18 ready to fall into one of the recesses 19, thereby fixing the longitudinal position of D-shaft 18, and thereby the vertical position of unit 15. This will occur as soon as coil unit 15, together with shaft 18 are lifted above the top surface of the receiver cabinet to a desired height.

In this elevated and longitudinally fixed position of shaft 18, the latter, together with coil unit 15, remains still rotatable together with sleeve 23 and in opening 22 of bracket 20.

Thus, the directional position of the tape antennas when in operative condition, may be adjusted to any desired angle of reception.

Fig. 4 exemplifies the manner in which the coils of a pair of antenna tapes 29, 30 are arranged inside a supporting box 31. The housings 32, 33 for the coils are attached to opposite side walls of box 31 in a manner not shown and irrelevant for the present explanation. The coils are arranged in parallel planes but sideways displaced with respect to each other so as to permit tapes 29, 30 to cross without touching each other.

Otherwise, Fig. 4 represents a modification of Figs. 1 and 2 in that the top wall 34 of box 31 is not square shaped but round, fitting into a corresponding round opening which is recessed at the edge as shown in the drawing, in top wall 35 of receiver. In this way, box 31 and the associated antenna tapes 29, 30, may be rotated at any desired angle of reception, for example, by turning knob 36 attached to the top wall 34 of box 31. Such rotation may be achieved without involving any lifting of box 31.

Fig. 5 schematically illustrates a modification of the coil arrangement of Fig. 4. The coils or coil housings 37, 38 are mounted, insulated from each other by an insulating disc 39 with which they form together a single unit flatly arranged side by side in parallel planes.

Housings 37, 38 are of conducting metal and the inner ends of the antenna tapes are attached to housings 37, 38 or to shafts 40, 41 mounted in the housings so as to have electrical contact therewith.

In this way, electrical connection between the receiver proper and the antenna unit may be achieved independently from the assembly of unit parts 37, 38 and 39.

In Fig. 6 a pair of coil housings 42, 43 are mounted in electrical contact with each other for a circuit where it is desired to have the inner ends of the tapes permanently interconnected.

Fig. 7 shows a circuit diagram in which the inner ends of tape antennas 44, 45 are insulated from each other and also connected to the terminals of the primary 46 of a transformer 47. The secondary 48 of transformer 47, at one terminal

thereof, at 49, is grounded, and at the other terminal thereof, at 50, is connected to the inner conductor 51 of a transmission line, the outer conductor 52 of which is also grounded.

Fig. 8 represents another circuit diagram in which the inner ends of a pair of antenna tapes 53, 54 are electrically interconnected at 55, and also grounded.

Antenna 54 at a distance from point 55 of about one-third of its length, is connected at point 56, to the inner conductor 57 of a transmission line. The outer conductor 58 in this line is grounded.

Figs. 9A and 9B illustrate a coil housing 59 made of metal or plastic with the inner end 60 of tape 61 connected at 62 to a flat spring 63 which in turn is attached to shaft 64 mounted in housing 59.

If necessary, spring 63 may be omitted and the end 60 of tape 61 directly attached to shaft 64 in housing 59. Then only the springiness inherent in the tape is used to effect or faciiltate automatic recoil of tape 61.

Tape 61 may be printed or engraved appropriately to indicate wave length, station, channel or any other reference to the function of the antenna at a predetermined length.

Also, if necessary, housing and tape may be provided with any other shape, dimensions, construction or material without exceeding the scope of this invention.

Fig. 10 shows a coil housing 65 coupled over shaft 66 and transmission gears 67, 68, to a turning knob 69. This is to permit adjustment of the antenna length by turning a knob or a similar member which may be attached outside of the receiver or at any other point distant from the coil. A corresponding stationary scale may be provided cooperating with knob 69 to indicate the position of the knob or length of the antenna tape, extending from housing 65, or corresponding channel or station, or any other identification marks.

Any type of transmission may be inserted between shaft 66 and knob 69, without exceeding the scope of this invention.

It is apparent that not only one coil but two or more coils may be attached to the gear or any transmission mechanism to permit simultaneous and equal tape extension within the framework of this invention.

Fig. 11 indicates schematically the shafts 70, 71 of two antenna tape coils (not shown). Shaft 72 carrying knob 73 is coupled to shafts 70, 71 over gears 74, 75, 76, 77; thus knob 73 will turn the coils attached to 70, 71 in opposite directions, thus permitting through gears 74—77 simultaneous and equal extension into space of the tapes associated with the two coils (not shown). Gear 77 is also coupled over an additional gear 78 to shaft 79 of a tuner unit or to any other shaft coupled with such tuner unit.

Thus it becomes possible from knob 73 to control not only the length of the two coil tapes, but also the tuning position of the receiver.

By appropriate dimensioning of gears 74—78 or any other suitable transmission mechanism of the linear and non-linear type, the length of the antenna tapes may be brought substantially to correspond with the tuning position required for such antenna length, thus permitting synchronism between tuning positions and antenna length adjustments.

Fig. 12 shows a pair of square-shaped coil housings 80', 80 attached to opposite sides of a common insulating holder or plate 81, with the tapes emerging from the housings at the top of these housings, thus adding to the compactness of the unit.

Insulating plate 81 in turn is attached with a top extension 82, knob 83 and screw 84, to a circular plate or disc 85. This disc 85 is rotatable in a corresponding opening of top 86 of the receiver and held in place by a ring plate 87 attached to the inside of top wall 86. There is also a flanged extension 88 on the bottom side of plate 81 which feeds into a corresponding opening of bracket 89 attached to side wall 90 of the receiver. This extension 88 permits guidance of unit 79, 80, 81, while it is rotated by knob 83.

Tapes 91, 92 when in operative position extend through appropriately dimensioned radial slots in disc 85, which permits simultaneous rotation of the two tapes without lifting the unit.

In non-operative position, the coil unit is practically flush with or covered by the top surface 86 of the receiver.

Figure 13 shows portable or home receiver 93 with the coil schematically indicated at disc 94 with knob 95 projecting therefrom. In the arrangement shown, the unit is arranged in the left back corner of the top surface 94 of receiver 93. In this arrangement it has been found advisable for minimum space requirements and ready portability to arrange television tube 96 immediately above the tuning unit 97 indicated by dotted lines. Loudspeaker 98 is arranged on or near one of the inclined side walls, preferably side wall 99, and preferably the right one, as shown, which give the receiver a pyramidal shape.

Fig. 14 shows schematically a tape in cross-sections with a plastic, preferably Bakelite base 100, sprayed or plated with conductive powder 101. The curvature of the tape serves to enhance its self-supporting properties. Instead of or in addition to curvature, a central rib or a groove may be provided to increase such support.

Instead of the arrangement shown, metal may be incorporated inside the plastic tape in the form of metal strip or metallised paper, without exceeding the scope of this invention.

Fig. 15 shows a modification of Fig. 12 in that the holding plate 103 of the coil unit (80' in Fig. 12) is shown upheld only by deck plate 104. There is no rotational mounting inside the receiver.

A number of screws 105 are provided circumferentially arranged on the bottom side of disc 104 and provided with sleeves 105, which form guides cooperating with the inner edge of the ring plate 106 attached to the inside of top wall 107.

Thus the entire unit may be suspended on a single disc shaped plate 104 without additional guidance except a sliding action between sleeves 105 bracket and ring plate 106. Thus construction and assembly of the coil unit may be simplified for certain conditions.

It is of course possible to design any sort and type of coil unit and unit support in accordance with the invention and for the purpose of its application, without exceeding the scope of this invention.

For example, instead of linearly extending into space, the tape may be in the form of a loop, which is either open in the form of an inverted U or closed, starting from one point near the top of the cabinet and returning to a point near that starting point. There also may be two loops

of this type extending in opposite directions forming adjacent inverted U's or a cluster-like loop structure. All these modifications are within the scope of this invention.

Another example of modifying the invention as described and illustrated, consists in providing a curvature in the tape which is opposite to the curvature shown in Fig. 9A. In Fig. 9A at **108**, tape **61** is shown to be curved concavely with respect to the centre **64** of coil housing **59**. While this is the usual way of curving tapes available on the market, such arrangement has the disadvantage that the tape or tapes as shown, for example, in Figs. 4 and 5 emerge from their associated coils at the bottom of the coil housing.

In a modification of the curvature as shown in Fig. 9A, in dotted lines at **109**, tape **61** is curved convexly with respect to the centre **64** of coil housing **59**. This makes it possible, as shown in Fig. 12, to provide tapes emerging from the tops of the associated housings and to arrange these housings **80**, **80'** (prime) co-axially with a minimum of space requirements, while at the same time providing free extension into space over a sufficient length.

In the case of convex curvatures it has been particularly advisable to provide an additional spring as shown in Fig. 9B, at **63**, to facilitate the re-winding of the coil tape.

What I claim is:

1. In a television apparatus, a cabinet and an antenna system supported by said cabinet, said system comprising a pair of conductors each having two positions, an inoperative one in which said conductors are wound up into spiral coils, and an operative position in which said conductors are at least partially wound off to form an upwardly extending angle and means for supporting said coils as a unit substantially below the surface of the cabinet, the top of said unit being flush with the top of the cabinet, and having openings permitting the conductors to extend therethrough, said unit being supported rotatable on said cabinet to permit rotation of the conductors independent from the longitudinal position of said conductors.

2. Apparatus according to claim 1 wherein said coils are supported as a unit arranged before operation below the surface of the cabinet, an opening being provided in said surface and means raising the unit for operation above the surface through said opening.

3. Apparatus according to claim 1 wherein the coils are supported as a unit substantially below the surface of the cabinet, the top of said unit being flush with the top of the cabinet, and having openings permitting the conductors to extend therethrough, said unit being supported rotatable on said cabinet to permit rotation of the conductors independent from the longitudinal position of the conductors, said conductors being rotatable from the outside of the cabinet.

4. Television apparatus according to claim 1 wherein the two conductors are attached to axes which are mechanically coupled to each other and wherein there is a tuner mechanically coupled to said axes so as to permit length of antenna and tuning position to be coordinated.

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